

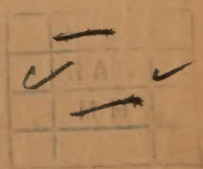


ANNUAL REPORT

1959-1960



DEPARTMENT OF AGRICULTURE
NEW SOUTH WALES



1960

PARLIAMENT OF NEW SOUTH WALES

REPORT

OF THE

DEPARTMENT OF AGRICULTURE NEW SOUTH WALES

FOR THE

Year ended 30th June, 1960

BY COMMAND

Ordered to be printed, 4 October, 1960

Wholly set up and printed in Australia by

VICTOR C. N. BLIGHT, GOVERNMENT PRINTER, SYDNEY, NEW SOUTH WALES

1961

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AS AT 30th JUNE, 1960

DEPARTMENT OF AGRICULTURE*

Minister for Agriculture	Hon. R. B. NOTT, M.L.A.
Under Secretary	Mr. E. O. TOUT.
Assistant Under Secretary	Mr. G. EDGAR.
Director of Agriculture	Dr. H. J. HYNES.
Accountant	H. J. CHARDON.
Chief Clerk	P. S. HILL.
Personnel Officer	C. B. CAMPBELL.
Pastures Protection Officer	S. W. WISE.
Legal Officer	J. L. HAGER.
Architect	H. A. BROWNE.
Senior Biometrician	F. C. MCCLEERY.
Chief Research Liaison Officer	Dr. S. L. MACINDOE.
Division of Plant Industry—	
Chief	W. H. G. POGGENDORFF.
Deputy Chief	A. C. ORMAN.
Principal Agronomist (Pastures)	C. K. VEARS.
Principal Agronomist (Research)	N. S. SHIRLOW.
Principal Agronomist (Extension)	G. NICHOLSON.
Division of Horticulture—	
Chief	H. W. EASTWOOD.
Deputy Chief	J. A. BALLANTYNE.
Principal Fruit Officer (Extension)	R. G. S. KEBBY.
Principal Fruit Officer (Research)	B. O. FRENCH.
Senior Inspector (Export and Import Branch)	L. T. BILBE.
Division of Animal Industry—	
Chief	C. C. BLUMER.
Deputy Chief	R. M. WATTS.
Director of Veterinary Research	J. C. KEAST.
Principal Veterinary Research Officer	E. J. H. MCBARRON.
Chairman, Board of Tick Control	J. N. HENRY.
Principal Veterinary Officer	N. K. GOLDING.
Principal Veterinary Officer (Meat Inspection)	R. A. HALL.
Principal Livestock Officer (Sheep and Wool)	A. K. CANTRILL.
Principal Livestock Officer (Horses, Beef Cattle and Goats)	W. J. B. MURPHY.
Principal Livestock Officer (Pigs)	G. M. D. CARSE.
Principal Livestock Officer (Poultry)	V. H. M. BRANN.
Principal Livestock Officer (Apiculture)	A. A. CLEMSON.
Division of Dairying—	
Chief	A. C. SMALL.
Deputy Chief	I. W. SCOTT.
Principal Dairy Officer	J. D. L. MCGIBBON.
Principal Dairy Officer (Herd Improvement)	F. A. VERNON.
Division of Science Services—	
Chief	Dr. C. J. P. MAGEE.
Chief Biologist	W. S. SUTTON.
Chief Entomologist	S. L. ALLMAN.
Chief Chemist	T. H. JOHNS.
Director of the Royal Botanic Gardens and National Herbarium and Chief Botanist	R. H. ANDERSON.
Division of Information Services—	
Chief	H. PARRY BROWN.
Editor of Publications	R. J. K. SYNNOTT.
Organiser, Agricultural Bureau	J. J. SLATER.
Senior Extension Officer (Women's Service)	Miss N. M. FOSKETT.
Division of Marketing and Agricultural Economics—	
Chief	C. J. KING.
Principal Economics Research Officer	P. C. DRUCE.

As at 30th June, 1960
Department of Agriculture—*continued*

Regional Extension Services—

Chief	J. L. GREEN.
Regional Supervisors of Agriculture—	
Southern Region	R. C. MADSEN.
North Coast Region	S. R. BALLARD.
Western Region	B. D. AMENT.
South Coast and Tablelands	R. W. SHELLEY.
South-Western Region	G. A. CRAWFORD.
Northern Region	R. D. EASTOE.
Mid-Coast and Hunter Region	E. C. CONNOR.
Mid-Western Region	F. J. NICHOLSON.
North-Western Region	J. A. O'REILLY.

Hawkesbury Agricultural College—

Principal	H. R. RICHARDSON.
Deputy Principal	W. MCCARROL.
Farm Supervisor	T. ADAMS.

Wagga Agricultural College and Experiment Station—

Principal	B. DOMAN.
Farm Supervisor	J. G. BALLANTYNE.

Wagga Agricultural Research Institute—

Director	Dr. A. T. PUGSLEY.
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Experiment Farms and Stations—

Chief		A. PEARSON.
Bathurst Experiment Farm ..	Manager	C. H. MORT.
Condobolin Experiment Farm ..	Manager	J. C. ENGLAND.
Cowra Experiment Farm	Manager	J. M. ARTHUR.
Glenfield Veterinary Research Station	Director	J. C. KEAST.
Gosford Citrus Experiment Station	Officer-in-Charge	L. F. MANDELSON.
Grafton Experiment Farm ..	Manager	C. E. COLLINS.
Griffith Viticultural Nursery..	Superintendent	Vacant.
Leeton Experiment Farm	Manager	C. R. HOOD.
Lower Murray Research Station, Dareton.....	Officer-in-Charge	F. S. OLDHAM.
Narrabri Experiment Farm ..	Manager	T. R. LAWLER.
New England Experiment Farm	Manager	E. TINDALE.
Poultry Experiment Station, Seven Hills	Manager	D. C. DUNCAN.
Tamworth Agricultural Experiment Station	Officer-in-Charge	J. A. LOVERIDGE.
Temora Experiment Farm ..	Manager	F. D. MCKENZIE.
Trangie Agricultural Experiment Station	Manager	J. H. BALLARD.
Wollongbar Experiment Farm ..	Manager	Vacant.
Yanco Experiment Farm	Manager	R. J. FLYNN.
Alstonville Tropical Fruit Research Station	Officer-in-Charge	D. S. LEIGH.

* For details of staff of the various Divisions and Branches see New South Wales Department of Agriculture brochure "Directory of Officers".

For staff number totals see tabulation in this Report, page 22.

NEW SOUTH WALES

DEPARTMENT OF AGRICULTURE

Report of the Under Secretary to the Minister for the Year ended 30th June, 1960

Department of Agriculture,
Sydney, 30th September, 1960.

Dear Sir,

Herewith my Report for the Department of Agriculture for the year ended 30th June, 1960.

NOTES FROM CENTRAL ADMINISTRATION

Production Trends

Rural production was well above average. On the whole, it was at about the same level as in the previous year.

The Seasons.—Pastures in most areas dried off during the 1959 winter, when rainfall was mainly below average, but good spring and summer rains ensured a return to satisfactory pasture growth in most districts. They also enabled cereal crops to finish well and give above-average yields.

The pastoral position again deteriorated gradually during the late summer of 1960 and throughout the autumn. By the end of June pastures were mostly dry and supplementary feeding of stock was fairly general. General soaking rain was needed in all districts, particularly on the north-west plains and in the Western Division. There, drought and near-drought conditions were being experienced. However, water supplies were adequate in most areas and stock were mostly in fair to good condition; although, in some of the drier areas sheep and cattle were reflecting the unfavourable season.

Record Sheep Numbers.—At the end of March, 1960, sheep numbers in New South Wales were the highest on record—71.00 million head; an increase of 3.06 million on the previous year's record of 67.94 million head. Lambing results in most districts were above average.

Cattle Numbers.—Cattle numbers rose from 3.663 million head at the end of March, 1959, to 3.841 million in March, 1960. This increase was almost entirely in beef cattle.

Mutton and Lamb Production.—This was somewhat higher than in 1958-59, but output of beef and veal showed a marked decline. Production of pigmeats was slightly less than in the previous year.

Dairy Produce.—Butter production was 41,374 tons; 10 per cent. higher than in 1958-59. However, production of cheese was only 4,348 tons; 14 per cent. less than in 1958-59. Milk production in the Whole-Milk Zone was maintained at about the same level as in the previous year.

Egg Production.—53.50 million dozen eggs were produced; some 18 per cent. more than in 1958-59. Production in the second half of 1959-60 was at an exceptionally high level.

Cereal Crops.—It was another good season for most cereals. The wheat harvest was approximately 75.36 million bushels, an average yield of 19.1 bushels per acre. Production was the highest for ten years; considerably higher than in 1958-59, when 66.44 million bushels of grain were harvested. Production of wheaten hay was 115,000 tons. As anticipated there was a substantial carry-over of wheat at the end of the 1958-59 season, and another heavy carry-over is anticipated in November, 1960.

The oat harvest was a lot below the 1958-59 record, but well up to average. Of 1,096,000 acres sown for all purposes, 567,000 acres were harvested for grain, 59,000 acres for hay, and 470,000 for green fodder. The grain harvest was approximately 11.13 million bushels. The hay yield was 77,000 tons.

Barley crops had an excellent season. The harvest of 2.58 million bushels was the second from highest on record.

The maize harvest was about average.

Rice Production Record.—Rice production was a record—125,000 tons; 1,000 tons more than the previous season's record. Yields per acre were also a record; 2.55 tons as against 2.39 tons in 1958-59.

Citrus Production Record.—Citrus production was 4.723 million bushels, a record; and considerably greater than in the previous year, when the harvest was 3.284 million bushels. The 1960-61 citrus crop is expected to be about average.

Feedstuff Supplies.—Supplies of most livestock feedstuffs were fairly adequate for most of the year, but towards the end a distinct shortage of pollard and bran had developed.

Fencing and other Steel Products.—There was a fairly acute shortage of steel fencing posts, and some other steel products, for part of the year.

Expenditure—Summary

Payments from Consolidated Revenue Fund relating to investigational, educational, and associated administrative activities, totalled £2,580,425. Receipts from sales of farm produce and from fees and other miscellaneous revenue, totalling £639,858, reduced the net cost of these services to £1,940,567.

Cattle tick eradication and control cost £965,252 (net), after allowing for stock-dipping fees and other minor items of revenue totalling £6,226. The Commonwealth Government has contributed £477,059 towards the campaign costs; leaving £488,193 to be borne by New South Wales.

The Royal Botanic Gardens and allied activities accounted for a further sum of £141,420, offset by receipts totalling £9,374; leaving a net cost of £132,046 to the Consolidated Revenue Fund.

Buildings and improvements of a permanent nature to a total cost of £114,353 were constructed. This was provided by the Treasury, from Loan funds.

Details of the Accounts of the Department, including numerous Special Deposits Accounts, opened with the Treasury in terms of the Special Deposits Account Act of 1911, are presented in the Appendix I.

Capital Works

The Department has in hand, for completion in 1960-61, capital works such as buildings, water supply, irrigation facilities, etc., estimated to cost £135,000.

In addition to works in hand, many improvements are essential at the Agricultural Colleges and at the Experiment Farms and Stations; by way of buildings, water supply, fencing, etc., in the interests of the research and education needed for the well-being and development of the rural industries.

Commonwealth Agricultural Extension Grant

This Grant, to enhance extension services and their effect, will continue until 30th June, 1965. Since the inception of the grant in 1952-53, New South Wales has received amounts varying from £50,000 to £75,000 per annum. As from 1st July, 1960, the total grant to the States will be £300,000 per annum and New South Wales will receive £75,000 per annum from the total.

More detail, of the effects of the Commonwealth Agricultural Extension Grant, is provided in later sections of this Report.

Commonwealth Dairy Industry Extension Grant

This Grant, from which £64,880 per annum is received by New South Wales to enhance extension services and their effect on the dairy industry, will continue to 30th June, 1963, when it may be renewed for a further period.

More detail, of the effects of this Grant, is provided in later sections of this Report.

Bush Fire and Flood Relief

There was no major bush fire or flood during the financial year 1959-60. This Department, as agent for the Bush Fire and Flood Relief Committee, made no payments for relief during the year.

Swine and Cattle Compensation Funds

The levy for Swine Compensation taxation was reviewed during the year, having regard to the falling off of claims over the past two years. Consequently the rate was reduced from 1s. to 6d. per pig from 1st January, 1960. Payments for compensation were approximately the same as for 1958-59.

The number of claims paid for Cattle Compensation was markedly less in 1959-60, mainly because of a steep decline in the number of cattle affected by the four major diseases.

United Nations Food and Agriculture Organization

The State FAO Committee continued to maintain close liaison with the National FAO Committee and, through it, with headquarters of the United Nations Food and Agriculture Organization in Rome.

The Director-General of FAO, Dr. B. R. Sen, visited Australia during April, 1960. He spent much of his short visit in New South Wales. All arrangements for his New South Wales itinerary were handled by the State FAO Committee.

Earlier, a lecture tour was arranged for Mr. G. E. Mulgrue, Regional Publicity Information Adviser for FAO in Bangkok.

Mr. Mulgrue lectured to schools and a wide range of other audiences in the Sydney and Newcastle areas, on FAO aims and objectives.

The Department has continued to support the FAO's Expanded Technical Programme of Assistance to under-developed countries, by assisting with the training of visiting agricultural students and government officers.

Australian Agricultural Council and Standing Committee on Agriculture

Two meetings of the Standing Committee on Agriculture and the Australian Agricultural Council were held; one in July, 1959 (Brisbane), and the other in February, 1960 (Hobart).

Main items discussed included additional wheat storage facilities; cattle and beef industry and dairy industry research; locust control; co-ordination of meat inspection services; control and eradication of fruit fly, and contagious bovine pleuro pneumonia.

Royal Botanic Gardens and Government Domain Trust

Five meetings of the Royal Botanic Gardens and Government Domain Trust were held.

Matters discussed included leases of the Gardens kiosk and Domain kiosk; proposals for playing fields above the Domain Car Parking Station; a proposal for the construction of an electricity substation in the Domain, and the building of a new kiosk in the Domain.

Farrer Memorial Trust

The Trustees of the Farrer Memorial Scholarship Fund held an Annual and one ordinary meeting.

The Annual Farrer Memorial Oration for 1959 was delivered by Dr. R. J. Noble, C.B.E., B.Sc.Agr., M.Sc.(Minn.), Ph.D.(Minn.), formerly Under Secretary and Director of the New South Wales Department of Agriculture, during a special session of the Argicultural Bureau State Congress at Hawkesbury Agricultural College on 14th July, 1959.

Subject of the Oration was "Agriculture and the United Nations". The text was subsequently published in the *Agricultural Gazette of N.S.W.*

Dr. Noble was presented with the 1959 Farrer Memorial Medal on behalf of the Trustees, in recognition of his distinguished service in agricultural science.

The accounts of the Trust have been audited and found satisfactory by the New South Wales Auditor-General.

Dr. H. J. Hynes, D.Sc.Agr., M.Sc.(Minn.), on his appointment as Director of Agriculture of the New South Wales Department of Agriculture, became an official Trustee *vice* Mr. W. H. G. Pogendorf.

The 1960 Farrer Memorial Research Scholarship was awarded to:—

Mr. P. W. Ellyard, B.Sc.Agr., Soil Chemist, Department of Agriculture.

Mr. Ellyard elected to take up the scholarship at Cornell University, U.S.A.; to study the influence of soil water on the performance of the wheat plant. Mr. Ellyard departed for the U.S.A. on 3rd January, 1960.

The Scholarship was awarded initially for a period of 12 months.

Leave of absence for 6 months was granted to a member of the Trust, Mr. A. McCorquodale, for a private visit overseas.

McGarvie Smith Institute

A large range of vaccines was produced at the McGarvie Smith Institute, and sold throughout Australia and in a number of overseas countries.

In accordance with the McGarvie Smith Institute Incorporation Act, 1928, profits from the sale of vaccines are applied to the promotion and advancement of veterinary education and research. A trading loss was sustained this year, but the Trustees are seeking new markets for the sale of their products.

Rural Credit

Difficulties in obtaining Bank credit for farm developmental purposes continued to affect farm development and production. However, establishment of the Commonwealth Development Bank of Australia during the year is expected to alleviate the difficult credit situation facing many producers. The activities of this organization are being watched with interest, with a view to assessing its affect on supply of credit for development.

Honey Marketing Poll

Following a petition from honey producers, for establishment of a State Honey Marketing Board, a poll was held. The proposal to establish a Board was defeated by a narrow margin. Since that rejection, action has been taken by producers' associates to investigate the possibilities of establishing an Australia-wide Honey Marketing Authority.

Centralised Killing of Stock in Country Areas

The Inter-Departmental Country Abattoirs Committee, comprising representatives from the Department of Agriculture and Local Government, has submitted its report on the country slaughtering of stock for human consumption. The report was tabled in Parliament on 15th March, 1960, by the Minister, and ordered to be printed.

The report recommended *inter alia* the definition of 30 central killing districts; 24 to be served by existing abattoirs and six by the construction of new abattoirs. It further recommended that the six new abattoirs should be owned and operated by Abattoir County Councils, in accordance with the provisions of the Local Government Act.

Meat Marketing Investigation

The Chief of the Division of Marketing and Agricultural Economics, Mr. C. J. King, visited North America during the latter part of the financial year to investigate the handling and marketing of meat in the United States and Canada at all levels from the farm to the retailer. A report on the North American meat marketing situation will be submitted later.



New Laboratories for Science Services Division, at Rydalmere

Although the £400,000 block of laboratories, for which the Foundation Stone was set only in May, 1959, has not yet been completed, the Biology and Entomology Branches have been able to move in. The Chemistry Branch also will be there shortly.

Office Accommodation

Office accommodation for officers stationed in country towns is constantly under review. Improvements have been effected wherever possible, in the interests not only of the staff but of members of the public who seek contact with them.

During 1959-60, additional or improved accommodation was provided at Albury, Broken Hill, Coffs Harbour, Coonabarabran, Crookwell, Deniliquin, Dubbo, Glen Innes, Gunnedah, Kempsey, Muswellbrook, Narrandera and Narrabri. In addition, negotiations have progressed at a number of other centres towards improved office facilities.

New Science Service Laboratories at Rydalmere

The £400,000 establishment at Rydalmere to accommodate the Biology, Entomology and Chemistry Branches of Division of Science Services was scheduled to be completed in March, 1960. Building was still in progress at the end of the financial year. However, one section of the building was ready earlier for occupation, and Biology and Entomology Branches moved to Rydalmere on 2nd May, 1960. The chemistry section of the new building is not ready for occupation.

Full occupation of the building in 1960-61 will enable the three Branches to function in co-ordination, to provide an improved service to the public and the remainder of the Department.

Provision of More Student Accommodation at Wagga

Public Works Department has plans in hand and provision has been made in the Loan Fund estimates for commencement of an additional new residential block at Wagga Agricultural College to house 66 students.

Of the increase, 24 bedrooms are substitutes for existing temporary accommodation. The latter will be put to store-room and recreational uses. The remaining 42 will be the net increase, enabling student numbers to rise from 96 to 138.

Development of the Newer Experiment Stations

Alstonville Tropical Fruit Research Station, Narrabri Experiment Farm and Tamworth Agricultural Experiment Station have been further developed. There is detail in the report of the Experiment Farms and Stations Branch.

In respect of Tamworth Agricultural Experiment Station contracts in the sum of £59,000 were let for capital improvements; for further development of that institution for intensive research work. Research staff is being substantially increased there, and a rapid development of the research programme is anticipated.

Cattle Tick Control

Boonoo Boonoo, Legume and North Cheviot Tick Quarantine Areas were released from quarantine. They comprise about 400 sq. miles.

In the Grafton area, no cattle tick were found, in a concerted inspection programme of four months' from 1st March to 30th June concerned with all stock prior to their movement. In the Special Quarantine Areas of Clarenza and South Gate the last tick infestation found was in December, 1958. These inspections will continue in the forthcoming year and will determine whether Grafton area will be released.

In Copmanhurst area fairly widespread light tick infestation was detected.

There has been a big increase in the number of DDT dips. All sections other than the Tweed and Richmond have this acaricide in the dips. An extension of arsenic-resistant tick infestations has occurred as expected. Consequently, more dips had to be charged with the chlorinated hydrocarbon acaricides.

A suitable property was located as a Cattle Tick Research Centre, but could not be acquired. Funds were available for the purchase but the price asked was greatly in excess of the Valuer-General's figure.

Cattle Tick Investigation Committee

An interesting development in the tick quarantine administration was the setting up of a Cattle Tick Investigation Committee. This is to inquire into various phases of cattle tick control, and the practicability of an eradication programme. The Committee took evidence from various stock-owners' organisations, the Board of Tick Control and Departmental officers. As well as conducting the on-the-spot inquiry into the cattle tick problem, the Committee visited all parts of the Tick Quarantine Areas—to assess at first hand the nature and extent of the cattle tick problem on the far north coast. This report is expected early in the forthcoming year.

Three Additional Veterinary Districts

The Public Service Board agreed to the appointment of three additional District Veterinary Officers. This allowed division of the three former Districts of "North", "West" and "South". Additional headquarters are now Narrabri, Dubbo and Narrandera, respectively. Two of the new appointees were formerly veterinary inspectors. This forward move, in further decentralising the Department's veterinary service, brings to ten the number of District Veterinary Officers.

Shortage of Veterinary Inspectors

The field service is short of twenty Veterinary Inspectors in the Central and Eastern Divisions of the State. All eleven Pastures Protection Districts in the Western Division are vacant. In addition, there is an over-all shortage of seven Veterinary Officers.

Tuberculosis Quarantine Area

The planned extension of tuberculosis testing, aimed at practical application of the results in an eradication programme has commenced. The Illawarra Tuberculosis Quarantine Area situated towards the southern limit of the Board's Milk Zone area, has been established. It embraces some 60,000 head of cattle, on 900 properties.

Three New Sheep and Wool Officer Districts

Three District Livestock Officers (Sheep and Wool) have been appointed in the Western Division, with headquarters at Bourke, Broken Hill, and Wentworth respectively. This was with the aid of funds provided by the Wool Research Committee.

District Agronomy Research Officers

A further step in decentralisation of agronomic research was made by the location of a research agronomist respectively at Maitland, Taree and Inverell.

On the black soils of the Inverell-Graman area, the "black soil scarab" is causing serious destruction of pasture cover, with attendant erosion risks and losses in pastoral and crop production. A research entomologist and a research agronomist have been assigned as a team to study the problem.

In the Maitland and Taree districts, the research agronomists are studying agronomic means by which farm returns may be improved and made more economic, especially in the dairying industry.

This development of a system of district research agronomists has been notable for the ready co-operation and financial support given to it by commercial firms; in particular, the Hunter Valley Co-operative Dairy Company Ltd., the Sulphide Corporation Pty. Ltd., Australian Fertilisers Ltd., and I.C.I.A.N.Z. Ltd.

The Taree position has been established under an agreement with the Manning District Agricultural Research Council. The Department pays the salary and travel expenses of the agronomist, and the Research Council has agreed to pay £2,500 per year into a research fund for a period of five years. The fund will be used to cover the cost and maintenance of a vehicle, the cost of seeds, fertilisers, fencing, and special equipment, and the employment of a field assistant and casual labour as required. The initial period is five years. The agreement may be extended with the consent of both parties.

Extension of Gypsum for Pasture Establishment

Research by the C.S.I.R.O. at Deniliquin has shown that treatment of certain difficult soils in southern irrigation districts with dissolved gypsum improves them greatly for pasture establishment. So that the method of treatment may be adopted as quickly as possible, a research liaison agronomist has been appointed to Deniliquin by the Department to extend this C.S.I.R.O. research finding to farmers.

Beef Cattle Improvement

In the beef cattle investigational field, considerable progress has been made in the further study of beef cattle breeding, and selection for production-factors. The work has assumed greater significance in view of the existing embargo on importation of stud stock from overseas, and the need to take into account the heritability of rate of gain, etc., in the selection of stud sires and foundation females.

Decentralised Water Testing Service

The water testing services of the Department have been partially decentralised.

Electronic equipment and chemical apparatus were acquired and assembled into readily transportable units to make an "on the spot" service available to landholders in each Agricultural Region. The "on the spot" advice as to suitability of water for pastoral use has been particularly valuable to landholders under the dry conditions experienced in many areas in the past six months. There is further reference to the service in the Chemistry Branch's section of this Report.

"1080" Impact on the Rabbit Problem

The increasing use of Sodium fluoroacetate ("1080") as a rabbit poison has made a great impact on rabbit destruction. Unlike myxomatosis, there is no chance of rabbits building up resistance or immunity to it. The poison is proving equally effective with both high and low rabbit populations, and in both rough and clear country.

Field officers in every Pastures Protection District have now been trained and through these officers the material is now therefore available State-wide. Landholders are being encouraged to use it to the fullest possible extent as an aid to myxomatosis.

Argentine Ant Eradication Campaign

The campaign, commenced in 1952 in co-operation with the C.S.I.R.O. and the N.S.W. Department of Local Government, was brought to a successful conclusion in December, 1959. It was a large-scale attempt to eradicate Argentine ants from the Sydney area. As a result, the pest has been eradicated from some 3,600 acres at a cost of £80,000. The cost was shared equally by the N.S.W. Treasury and Local Government bodies and other instrumentalities.

Progress in Fruit Fly Control

The registration and recommendation by this Department of an organo-phosphorus material marketed as rogor gave new hope to home gardeners who in great numbers have in the past suffered fruit fly depredations in their fruits and tomatoes. Where used as advised by this Department substantial control was achieved. Many enthusiastic reports of satisfaction with the control measures have been received.

Research attention is being given to development of an effective use for chemical, male-fly attractants. Considerable promise has been shown by a compound known as DMPH; for survey work in particular.

Studies on commodity treatment for disinfestation of citrus fruits have almost reached a stage where commercial application of EDB fumigation treatment is a possibility.

There is more detail of the fruit fly research and results in the Entomology Branch's section of this Report.

Spur-throated Locust "Declared"

For the first time in this State it became necessary to take control action against the spur-throated locust. This pest considerably damaged north-western wheat crops during the spring. It was "declared" under the Noxious Insects Act; and a good deal of aerial spraying with aldrin, supplied through the Pastures Protection Boards, was done.

Black Soil Scarab Studies

This serious pest continued to cause trouble in pastures and crops grown on the fertile black soils of the north-west. It is especially serious when dry conditions reduce the vigour of plant growth.

Insecticidal studies, and investigations into the biology and population-dynamics of this insect have continued at Graman. Agronomic aspects of the problem have also received considerable attention. There is further detail in the Entomology Branch's section of this Report.

Study of Dieldrin Resistance in Sheep Blowfly

The problem of dieldrin resistance in the Australian Sheep Blowfly has been further studied by a Departmental entomologist, and has been shown to be a single gene characteristic. Resistance may, in some circumstances, be developed in one generation, but reversion to the susceptible condition may occur.

The officer concerned with these investigations has proceeded overseas on a grant from the Wool Research Fund. He will present an account of his findings to the 11th International Entomological Conference at Vienna.

Uniform Pasture Survey Extension Trials ("U.P.S.E.T.")

Results in the first and second years indicate that this technique will facilitate more precise recommendations to farmers in problem areas, and will highlight areas where additional research into pasture species, pasture establishment and pasture plant nutrition are needed.

Four times as many trials as previously were laid down by district agronomists in each of the two years of U.P.S.E.T. Farmers have shown a keen interest in the trials.

Aerial Pasture Improvement

Rapid increase in aerial topdressing of pastures with superphosphate, sulphur-fortified super or gypsum has been one of the significant developments of the year. As against 100 tons of superphosphate dropped aurally in 1949, the tonnage has increased to 110,000 tons in 1959-60.

Clover and grass seeds were overseeded with approximately 20 per cent. of this tonnage; and considerable acreages are being seeded in separate operations, using light aircraft.

About 14,000,000 acres in New South Wales are adaptable to improvement by aerial seeding and topdressing; hence the importance of this current trend.

A feature of the year's aerial pasture improvement activities was the organisation of "group schemes" to co-ordinate aerial operations, rail freighting, bulk storage, farm delivery, and the spreading of super on the individual holdings.

New Summer Legumes

The development of promising summer legumes, including *Phaseolus lathyroides*, "Siratro", *Dolichos lab lab*, *Dolichos axillaris*, *Glycine javanica* and *Desmodium uncinatum*, has opened up possible "feed year" improvements in some coastal areas until now affected by autumn and winter "protein drought." Testing of these legumes for freedom from toxic properties, and for useful production under grazing to meet particular seasonal needs, has advanced considerably at Wolongbar and Grafton Experiment Farms.

Sorghum Alum

Sorghum alum has become a crop of major importance. It adapted itself to good soil conditions, and demonstrated its potential as a perennial summer fodder crop. The ban under the New South Wales Agricultural Seeds Act on sale of *Sorghum alum* seed was lifted, and seed was readily available.

Some 400,000 acres were sown during the year; much of it in the north western and central western regions. Some excellent reports were received on its drought resistance and grazing value in inland areas, both with and without irrigation.

A Seed Certification Scheme for the species was initiated by the Department. Present indications are that 2,000 to 3,000 bags of certified seed may be produced in the autumn of 1961.

Attention was given at Grafton Experiment Farm to selection of better strains. Selections made on general agronomic characteristics have been tested.

Record Pasture Seeds Production

Record production of certified pasture seeds was achieved in the 1959-60 season. Production included 1,800 tons of certified subterranean clover seed; 100 tons of certified *Phalaris tuberosa*; 5½ tons of barrel medic 173; and 30 tons of perennial ryegrass, including 6 tons of the Kangaroo Valley strain.

To facilitate and promote development of the certified pasture seeds industry in New South Wales, approval has been given for appointment of a Pasture Seeds Production Officer, Division of Plant Industry.

Serrated Tussock Research

The continued research on serrated tussock control has clearly demonstrated that clovers may be established on infested non-arable land, with marked increase in carrying capacity and a valuable degree of control of serrated tussock. The research results directly led to the aerial seeding of 10,000 acres in the Central Tablelands districts this year.

Success of Tobacco Research

The tobacco research programme to be carried out by the Department follows a grant in excess of £50,000; approved by the Central Tobacco Advisory Committee for maintenance of present activities, and initial costs of establishment of a Tobacco Research Station.

The research to provide growers with a blue mould resistant variety of tobacco has been successful; supported by field trials Commonwealth-wide.

More than a ton of the leaf was distributed to the four major Australian tobacco manufacturers for manufacturing tests. If their results are satisfactory, the strain will be released to growers during the 1961-62 season.

During the year, the Department leased five acres of land for establishment of a Tobacco Sub-Station some eighteen miles from the New England Experiment Farm. The Sub-Station is used for testing early generation cross-breeds.

Development of Cotton

Farmers showed increased interest in cotton as an irrigation crop. Experiments on economic production, working with a world-wide collection of varieties, continued at Narrabri Experiment Farm. Lines obtained from the experiments indicated a potential production of at least 2,000 lb. of seed cotton per acre under irrigation.



Selected Chemicals Kill Serrated Tussock

But, it has been shown that unless the sprayed area is over-sown (background), re-infestation will occur (foreground).



Ecological Control of Serrated Tussock

Experiments have shown that subterranean clover over-sown on unploughed ground will smother serrated tussock.



Application of Research Finding in Serrated Tussock Control

Aerially sown subterranean and white clovers smothering serrated tussock. In the central tablelands areas alone, 10,000 acres of infested land were aerially sown in the past year.

What was probably the first Cotton Field Day held in New South Wales was organised by the Department at Barham in the Murray Valley. It was attended by several hundred farmers.

Expansion of Winter Wheats Acreage

The acreage sown to winter wheats expanded in 1959; with provisional recommendation of the variety Winglen, and the naming of Windebri (a sister line to Winglen). Both varieties are of appreciably better baking quality than the only other commercially grown winter wheat variety Winter Minflor.

New Vegetable Varieties Released

Success of the Department's vegetable improvement programme is illustrated by the release and success of the French bean "College Pride", and the potato "Murru".

"College Pride", bred at Hawkesbury Agricultural College, has given pleasing results in its first year of commercial production and has consistently outyielded the until-now leading commercial varieties.

"Murru", developed at New England Experiment Farm, is a red-skinned potato. It has appealed to growers in all tableland districts because of its high quality, nicely shaped, uniform medium-sized tubers.

Dairy Products Research

The Dairy Produce Research and Sales Promotion Act, 1958, gave power to impose a levy on the manufacture of butter and cheese for the purposes of research and sales promotion.

The programme is being conducted in association with various Governmental and semi-Governmental bodies.

The Department submitted a project to cost £5,000 for the first year, in respect of research into cheese manufacture. Cheese with a retail selling value of approximately £500,000 is imported into Australia each year. The two cheeses considered to have the greatest possibility of increased sale in this country are Blue Vein and Gruyere.

The aspects of research to be covered by the Department's project are the stepping up of the maturing of cheese, improvement of the flavour and palatability, and methods of processing and packaging.

The Dairy Produce Board also voted to the Department funds for research into:—

- (a) Socio-economic investigations; to be done in association with the University of New England and the Commonwealth Bureau of Agricultural Economics, with adjustments between the Department and the University in respect of expenditure on salaries—according to the availability and location of staff. (£4,100)
- (b) Expansion of pasture species research. (£2,900)
- (c) Expansion of other pasture and animal research. (£4,900)

Except for appointment of a Supervisor of Dairy Industry Research, stationed at Lismore, little of these grants has been spent in 1959-60. Full implementation of the research programme will depend on the appointment of suitable workers. Every effort is being made to recruit them.

Increased Herd Recording

The year saw a sudden and unexpected expansion of the Herd Recording Movement, amounting to some 15 per cent. It resulted in the employment of seventy-six herd recorders. This has absorbed the available establishment. Indications are that further expansion will occur in the coming year. An approach has been made for additional establishment strength.

Milking Machine Efficiency Survey

Four officers are now operating full-time, in the survey of efficiency of milking machines. During the year, some 1,250 visits were made to farmers for this purpose.

Milking Machine Efficiency Surveys were originated to drive home to the farmer and the industry the need for improvement in milking machine efficiency and milking technique. The keen interest displayed by farmers indicates it is

serving its purpose amongst them. Meanwhile, on the manufacturing side, co-operation of the trade in the establishment of the "Performance of Milking Machine Components Committee" has indicated that the trade would be prepared to improve equipment to the ultimate benefit of the industry.

The "Standards of Performance of Milking Machine Components Committee" was set up under the aegis of the Dairy Research Foundation of the University of Sydney in co-operation with the New South Wales Department of Agriculture, the New South Wales Milk Board, various Traders' Associations, the Standards Association of Australia, the Australian Society of Dairy Technology and the Department of Primary Industry.

The Department has commenced a survey to establish the relationship between efficiency of milking machines and the incidence of mastitis in farmers' herds.

Staff Section

Appointments.—F. W. Evans, District Veterinary Officer; R. M. B. Dun, Special Veterinary Research Officer; P. S. Hill, Chief Clerk; I. W. Scott, Deputy Chief, Division of Dairying; F. A. Vernon, Principal Dairy Officer; C. E. Chapman, Special Dairy Officer; I. A. McWatters, Veterinary Officer; G. R. Hughes, Agronomist; P. W. Ellyard, Analyst; R. S. Sproule, Fruit Officer; J. C. Keast, Director of Veterinary Research, also Analyst under Stock Foods and Medicines Act, 1940; R. S. Wetherell, Agronomist; D. W. Crowfoot, Principal Dairy Officer; J. D. Bryden, Veterinary Officer; J. D. Fahy, Agronomist; C. R. Turkington, Fruit Officer; M. J. Watt, Entomologist; R. H. Kerrigan, Livestock Officer; G. J. Murtagh, Agronomist; W. T. Kirsop, Livestock Officer; O. G. Lysaght, Livestock Officer; K. G. Beirne, Lecturer; R. J. Roberts, Lecturer; F. A. C. Gibson, Entomologist; B. A. Winley, Lecturer; D. J. Wooding, Biometrician; G. N. Evans, Analyst; B. L. Dircks, Livestock Officer; W. A. Trimmer, Fruit Officer; J. B. Forsyth, Fruit Officer; T. H. Crofts, Livestock Officer; Miss L. R. Fraser, Special Plant Pathologist; Miss J. W. Vickery, Special Botanist; R. H. Anderson, Director of the Royal Botanic Gardens and National Herbarium and Chief Botanist; G. A. J. Pasfield, Special Entomologist; R. D. A. Polhill, Analyst; K. J. Symes, Research Officer; E. G. Cuthbertson, Research Officer; R. H. Martin, Research Officer; F. F. A. G. M. J. Von Mengersen, Research Officer; H. D. R. Malcolm, Fruit Officer; P. J. Lancaster, Dairy Officer; C. J. Levick, Dairy Officer; F. J. Armstrong, Livestock Officer; J. S. Healey, Assistant Principal Veterinary Officer; Dusan Jakovljevic, Research Officer; P. J. Mylrea, Special Veterinary Research Officer; H. W. Eastwood, Chief, Division of Horticulture; J. A. Ballantyne, Deputy Chief, Division of Horticulture; R. G. S. Kebby, Principal Fruit Officer; C. D. Kohn, Research Officer; E. J. H. McBarron, Principal Veterinary Research Officer; John Van Der Meulen, Economics Research Officer; J. H. Syme, Agronomist; R. J. Esdaile, Agronomist; B. C. Imrie, Agronomist; J. P. Sharman, Agronomist; P. J. Ahrens, Veterinary Officer; W. A. Pattie, Livestock Officer; Miss B. G. Briggs, Botanist; P. G. F. Webb, Livestock Officer; G. S. Bilbe, Fruit Officer; J. P. Grellman, Livestock Officer; G. C. McFarlane, Special Economics Research Officer; N. S. Shirlow, Principal Agronomist; A. J. Williams, Biologist; P. A. Witschi, Agronomist; R. W. Smith, Livestock Officer; A. B. Dougherty, Agronomist; B. J. Scott, Agronomist; R. O. Doran, Livestock Officer; S. L. Macindoe, Chief Research Liaison Officer.

Retirements.—L. H. Beveridge, Livestock Officer; B. D. Davis, Inspector, Plant Diseases Act; James Fitzgerald, Gardener; E. B. Kemp, Clerk; F. T. Bowman, Chief, Division of Horticulture; A. A. Rollinson, Gardener; S. D. O. Robertson, Clerk; L. C. Yorke, Economics Research Officer; J. N. Hayden, Inspector, Plant Diseases Act; W. R. Honeybone, Clerk.

Deaths.—P. C. Bottrell, Inspector, Plant Diseases Act (10th March, 1960); S. J. Smith, Patrol Officer, Queensland Border (24th August, 1959); B. R. Mann, Patrol Officer, Queensland Border (10th March, 1960); J. R. Fisher, Analyst (16th March, 1960); L. J. Guthrie, Meat Inspector (9th June, 1960); Mrs. L. E. Wishart, Office Assistant (28th October, 1959); E. W. Coles, Herd Recorder (9th January, 1960); W. L. T. Gray, Patrol Officer, Riverton (9th October, 1959).

Departed for Overseas.—Mr. P. W. Ellyard, Analyst, Chemistry Branch, having been awarded the 1959 Farrer Memorial Research Scholarship, was granted leave to proceed to Cornell University, Ithaca, New York, to study the influence of soil water on the performance of the wheat plant.

Dr. C. J. Magee, Chief, Division of Science Services; to visit the United Kingdom to attend the Commonwealth Mycological Conference and the Commonwealth Agricultural Bureaux Review Conference, and to visit research institutions and banana markets in the United Kingdom, Vienna, U.S.A., Hawaii and Manilla.

Mr. C. F. Vears, Principal Agronomist (Pastures), Division of Plant Industry, to visit the United Kingdom to attend the 8th International Grasslands Conference at Reading and to visit Kenya, South Africa and U.S.A., to investigate various aspects of pasture management and pure seed production.

Mr. C. J. King, Chief, Division of Marketing and Agricultural Economics; to visit U.S.A. on a study tour of the livestock and meat packing industries, and to visit certain centres in the United Kingdom, Germany and Italy for enquiries on behalf of the Egg Marketing Board of New South Wales.

Mr. G. J. Shannahan, Entomologist, Entomology Branch; to visit Italy, United Kingdom and U.S.A. and research stations in Europe to discuss and demonstrate his findings and to continue on insecticidal resistance in sheep blowflies. Mr. Shannahan would also attend the 11th International Congress on Entomology in Vienna.

Returned from Overseas.—Mr. J. C. Keast, Director of Veterinary Research; who had attended the international Veterinary Congress in Madrid, and subsequently visited research centres in the United Kingdom and the U.S.A.

Dr. Joyce W. Vickery, Botanist; who had attended the 9th International Botanical Congress in Montreal, and the session of the Bureau of Nomenclature of the Congress; and had visited the Gray Herbarium of Harvard University and the United States National Herbarium at Washington.

Visited Overseas During the Year.—Mr. E. M. Matheson, Agronomist, visited New Zealand for discussions with officers of Lincoln Agricultural College and to visit the Rukuhia Soil Survey Station, Hamilton, and centres at Wellington, Christchurch and Auckland re wheat breeding.

Mr. P. H. Teague, Livestock Officer (Dairy Cattle), accompanied a shipment of Jersey Cattle to Vietnam for delivery to the Ben Cat Station: he spent some time training staff at that Station in Dairy Herd management.

Mr. H. R. Richardson, Principal, Hawkesbury Agricultural College, visited New Guinea to attend a Conference of agricultural extension officers of the Administration of Papua and New Guinea.

Mr. D. J. McDonald, Agronomist, attended meetings in Ceylon of the F.A.O. Working Parties of the International Rice Commission.

Staff Numbers at 30th June, 1960

	Public Service Board Appointees	Employed under Ministerial Authority	Total
Central Administration	604(1)	10 (2)	614
Division of Science Services	94 ¹	...	94
Division of Plant Industry	139	...	139
Division of Horticulture	114	..	114
Division of Dairying	137	..	137
Hawkesbury Agricultural College	70	70 (3)	140
Wagga Agricultural College	21	51 (4)	72
Experiment Farms and Nurseries	77	243 (5)	320
Division of Animal Industry—			
Head and District Offices	157	12	169
Meat Inspection Service	159	15	174
Queensland Border	41	1	42
Tick Quarantine Areas	26	578	604
Royal Botanic Gardens, etc.	112	7	119
	1,751	987	2,738

(1) Including *inter alia* the Division of Marketing and Agricultural Economics, and Division of Information Services.

(2) Including 4 casual employees.

(3) Including 10 casual employees.

(4) Including 5 casual employees.

(5) Including 56 casual employees.

Personnel Branch

Induction of Personnel.—Officers and employees entering upon duty at Head Office and metropolitan branches were interviewed, appropriately placed, and duly inducted.

Advice to Personnel.—Advice and guidance were furnished to members of the staff on educational matters and career prospects. Various personal problems were dealt with.

The Personnel Officer met country officers during his visits to several Regional headquarters and country institutions.

The Handbook of Personnel Policy and Practice published by the Public Service Board during the year proved to be a valuable compendium. Copies have been placed at the principal departmental centres throughout the State.

"Information for Newly Appointed Members of the Staff".—This publication has been revised. It is being reprinted and will shortly be in circulation.

Brochure "Professional Careers in Agriculture".—This has been revised for a 1960 edition.

A large number of inquiries from careers advisers, organisations, students and parents were dealt with and relevant literature distributed.

Liaison with P.S.B. Examination Branch.—This was closely maintained, in connection with the several Grade examinations throughout the year.

Tutorial Assistance.—Assistance was given to individuals preparing for grade examinations under Public Service Regulations. Text books and other tutorial matter were circulated among candidates. Tutorial classes were organised for metropolitan candidates. Correspondence relating to studies was conducted with country candidates.

Revised "Notes on the Relationship of Commonwealth, State and Overseas Government and Non-Government Organisations to the Department of Agriculture" became available. The "Notes" are a prescribed text for certain grade examinations. They also contain a valuable conspectus of departmental activities.

First Aid Service.—The Matron and First Aid Officer attended to 309 cases of minor indisposition or disability (137 male; 172 female). Contact was maintained with officers in hospitals and during after-care.

Trainee/Cadet System.—Nineteen Trainees (University) and Cadets (Agricultural College) completed their studies in 1959 and were appointed to positions in the Department.

Thirty-one new trainees and cadets were appointed in 1960; bringing to 74 the number currently undertaking courses, excluding traineeships that were suspended for the 1960 academic year.

Instructions to Trainees are under revision. The new edition will be available at the commencement of the 1961 academic year.

Training for Fellows under the Colombo Plan and F.A.O.—Facilities for appropriate studies in or information from the Department were made available to groups or individuals from Indonesia, Pakistan, Egypt, Thailand, India, the Philippines, Sarawak, Burma, North Borneo, Ceylon, Chile, Libya, Tanganyika and Uruguay. Close co-operation was maintained with the Commonwealth Office of Education in these respects.

Legal and Registration Branch

ACTS PASSED

Swine Compensation Taxation Act, 1959.—The stamp duty payable on the delivery of pigs to an abattoir for slaughter was reduced from 1s. to 6d. per pig. The rate of duty was reduced because of accumulated surpluses in the Swine Compensation Fund. The revenue from the stamp duty is paid into the Swine Compensation Fund, for payment of compensation for pigs destroyed and carcasses condemned on account of prescribed disease.

Farm Produce Agents (Amendment) Act, 1960.—This Act was passed to enable bananas to be marketed on a merchant basis, as distinct from an agency basis, without infringing certain provisions of the Farm Produce Agents Act, 1926, as amended. The special provisions of this amending legislation can be applied to any other section of fruit or vegetable production where the producers concerned decide that the marketing of their product on a merchant basis preferable to an agency basis.

Filled Milk Act, 1960.—This Act places a total ban on the manufacture and sale of filled milk. Filled milk is a product manufactured by incorporating the non-fat solids of whole milk with vegetable fat, the latter being a vegetable substitute for the natural butterfat extracted from the whole milk. It is capable of being manufactured and put on the market at a lower price than whole milk (liquid or dried). Therefore filled milk represented a serious economic threat to the dairy industry.

The prohibitions imposed by the Act were considered necessary for protection of industry vital to the general economy of the country. Similar legislation has been passed in other States.

Meat Industry (Amendment) Act, 1960.—This Act amended the Principal Act, to make further provision with respect to inspection of meat slaughtered within or brought into the Metropolitan Abattoir Area for export beyond the Commonwealth.

Such meat is inspected by Commonwealth meat inspectors. The object of the amending legislation is to make State inspection of such meat, and payment of inspection fees, unnecessary; except where the meat, instead of being exported as intended, is released on to the Sydney market.

The Act made other amendments of a machinery nature. It also validated the waiver, by the Treasurer, of certain accumulated interest payments on the capital indebtedness of the Metropolitan Meat Industry Board to the State in respect of the Homebush Abattoir.

REGULATIONS, PROCLAMATIONS

There were twenty-eight gazettals of Regulations, fifty-three Proclamations, and eighty-six Notifications.

Regulations were gazetted to require the compulsory testing of cattle for tuberculosis within quarantine areas. It is proposed under these Regulations to apply compulsory testing to eradicate the disease in specified areas and to gradually extend the areas—with the ultimate aim of eradicating the disease throughout the whole State.

Other regulations were gazetted to enable measures to be adopted for control of foot rot in areas of extensive infection.

Regulations were also gazetted to implement the provision of the Meat Industry (Amendment) Act, 1960, mentioned in a foregoing paragraph.

PROSECUTIONS

For offences under the various Acts administered by the Department, 164 persons were prosecuted.

ARBITRATION—AGRICULTURAL HOLDINGS ACT, 1941

Only one matter was referred to arbitration under the Act. The issue was whether a share-farmer of an agricultural property at Windsor was cultivating according to the rules of good husbandry.

REGISTRATIONS

Registrations effected during 1958-59 and those of 1959-60 are compared below:—

	1958-59	1959-60
Apiary registration	3,880	3,582
Potato licences	1,740	1,804
Stock foods	1,169	1,206
Stock medicines	1,650	1,657
Pest destroyers	1,349	1,664
Sheep brands	1,685	1,768
Sheep earmarks	1,926	1,956
Large stock brands	1,559	1,833
Fertilizers	630	678
Farm Produce Agents	311	316
Veterinary surgeons	411	417
Swine brands	607	759
Swine licences	28	35

Veterinary Surgeons Board

The Board met on only eight occasions; because the position of Registrar again became vacant.

The prescribed examination for veterinary graduates of overseas universities was held in September, 1959. Two candidates were successful and one failed. Since the enactment of the special legislation in 1952, twenty-seven candidates have been successful at the examination.

Stock Medicines Board

Twenty-four meetings of the Stock Medicines Board were held. Some 1,763 applications for registration of medicines were received; 78 of them are still under consideration, 27 have been withdrawn, one has been refused, and 1,657 medicines were granted registration.

Architects' Branch

Loan Funds and Consolidated Revenue Funds expended on new works and maintenance work were as follows:—

	£
Loan Funds	114,353
C.R. Funds	105,042

Work Completed.—This comprised administrative building, domestic water supply, and machinery shed, at the Alstonville Tropical Fruit Research Station; agronomy shed, installation of electricity, hot-water system to Manager's residence, and machinery shed, at Condobolin Experiment Farm; shearing shed, and yards at Cowra Experiment Farm; Fertiliser shed, and water supply, at Gosford Citrus Experiment Station; shearing shed, and yards, at Leeton Experiment Farm; poultry range houses, nutrition pens, and sewerage to cottage No. 3, at Seven Hills Poultry Experiment Station; new piggery buildings, sewerage to all cottages, office and farm hands' ablution block at Wollongbar Experiment Farm; agronomy shed, hay shed, and bird-proof enclosure, at Yanco Experiment Farm; two bird-proof enclosures, and glasshouse, at Tamworth Agricultural Experiment Station; septic installations to toilets for farm hand, and sewerage to four cottages, at New England Experiment Farm, Glen Innes; alterations to buildings at Berry Training Farm; sheep dip, and yards, at Shannon Vale Nutrition Station; septic installations to toilets for farm hands, at Lower Murray Research Station; establishment of an irrigation farm, at Narrabri.

Work Still Proceeding.—This includes remodelling of the kitchen at the Hawkesbury Agricultural College; new, commercial turkey-raising section, and stud horse stalls, and yards, at Wagga Agricultural College and Experiment Station; construction of dam, and irrigation installations, at Alstonville Tropical Fruit Research Station; glasshouse, and new electricity supply line, at New England Experiment Farm, Glen Innes; laboratory block, at Tamworth Agricultural Experiment Station; septic closets to Manager's residence and orchard cottage, at Bathurst Experiment Farm; hot-water system to Manager's residence, Grafton Experiment Farm.

Department of Public Works has commenced the drawings for a new dormitory block at Wagga Agricultural College and Experiment Station.

Maintenance Work.—This comprised painting and repairs to cottages and farm buildings at Bathurst Experiment Farm, Condobolin Experiment Farm, Cowra Experiment Farm, Gosford Citrus Experiment Station, Grafton Experiment Farm—including complete re-painting of quarters building, New England Experiment Farm—including repairs and painting of quarters, Tamworth Agricultural Experiment Station—including sewerage to cottage, No. 2, Temora Experiment Farm, Trangie Agricultural Experiment Station, Wollongbar Experiment Farm, Yanco Experiment Farm, Glenfield Veterinary Research Station, Queensland Border; also, desilting of tanks, sinking a bore, and maintenance and replacement of equipment at Public Watering Places in the Western Division of the State.

Extension Service.—Many inquiries concerning farmers' building problems were attended to by letter and by personal interview. Plans representing buildings to the value of £169,640 were supplied to farmers.

Pastures Protection Section

Sodium Fluoroacetate ("1080") in Rabbit Control.—"1080" is proving every bit as effective as had been hoped for in the light of other States and New Zealand experience; proving to be the greatest break-through since myxomatosis, and with no possibility of rabbits becoming resistant or immune to it. It has been equally effective with high and low rabbit populations, and in rough as well as clear country; providing rabbit destruction under conditions where, previously, landholders had been quite unable to deal with the pest. It is also a most economical means of rabbit destruction. Towards the end of the year, for example, a landholder in the Narrandera Pastures Protection District used "1080" in 2,500 acres of mainly rough country where he had never previously been able to control the pest. The results of this poisoning were extremely effective. The cost was approximately £100; less than 1s. per acre—a most effective and economical result.

The price of "1080" has been halved by the calling of competitive tenders for a 12 months' supply for each Pastures Protection Board. Cost of the poison is now only a very small part of a landholder's total costs for the job.

It has been decided that the poison may only be used with carrot as a bait. Best results are obtained by the use of this medium. Consideration is being given to means of ensuring carrot supplies at reasonable prices throughout the year.

Training for Pastures Protection Board Officers in use of "1080"—Further schools were conducted during the year and there is now at least one trained officer in every Pastures Protection District. Up to 30th June, 1960, seventy-five field officers of Pastures Protection Boards and twelve officers of Government Departments had been trained at the schools. There will be further training schools in the ensuing year.

Follow-up work has been conducted with Pastures Protection Boards and their field officers after the schools; so that the poison is used in their districts as widely as possible, and that the Boards' field officers adhere strictly to the techniques in which they are trained at the schools.

Appointment of Rabbit Inspectors.—The Minister approved of a recommendation by the Rabbit Control Advisory Committee that each Board be required to employ a field officer confined entirely to work connected with rabbit inspectional work. These Boards were directed that they must appoint an additional officer, confined to rabbit destruction activities. All but two have proceeded accordingly. In the two exceptions the Minister approved deferment, pending inspection of the two districts later this year by the Pastures Protection Field Officer.

The Australian Plague Locust.—In the spring of 1959 an extensive hatching of plague locust occurred in northern and western pastures Protection Districts but somewhat further south than the autumn infestation of that year. Insecticidal material was freely available and landholders again worked very well, using large quantities of insecticide in endeavours to control the locusts in the 'hopper stage. This co-operation was particularly noticeable in the Condobolin and Forbes Pastures Protection Districts.

Despite the efforts of landholders and of Pastures Protection Board officers sufficient locusts matured to form fairly large flying swarms. It was decided to treat these by spraying from aircraft. Tenders were invited for supply of scouting and spraying aircraft and these were available when needed.

One aircraft was used for scouting over the whole of the area from Coonamble to Gundagai and as far west as Hay. Only one officer was needed for this purpose. This saved time and expense as compared with having a large number of ground officers performing the function in motor vehicles.

A number of flying swarms were treated by spraying from Cessna aircraft. Some were completely destroyed, but others could not be treated so effectively—because of weather conditions or because they had not reached any great size or density.

Practically all of the hatching was destroyed either in the 'hopper or flying stage, and no substantial laying took place in the autumn.

Australian Plague Locust—Trial Control Campaign.—Dr. B. P. Uvarov, former Director of the Anti-Locust Research Centre, London, visited Australia to examine the local problem of controlling the Australian Plague Locust and other locusts.

He did not favour the arrangement made earlier for a Trial Control Campaign in the Bogan-Macquarie Outbreak Area. He thought it fortunate that such a campaign had never been tried out. He has made recommendations for future control work, and these are now being weighed within the Department and by the Australian Agricultural Council.

Dingos.—The various Dingo Boards have been examining means for improving their work.

The Lower North Coast and Tablelands Boards, for example, has decided to increase from £1 to £2 the bonus payable to active and financial members of Native Dog Destruction Associations over and above the standard rate of £3. This is in an endeavour to have the whole District covered by such Associations; with the thought that the landholder members of the Association are the people concerned most vitally with control of the pest, and therefore the most likely ones to deal with it, provided they can be convinced of the need.

The Central Tablelands and Hunter Board first decided that it would abandon payment of bonuses for scalps and would devote the money formerly used for this purpose towards increasing the funds for aerial baiting campaigns. Aerial baiting was at that stage thought to be very effective. Subsequent results proved to the contrary. The Board thereupon decided it would not continue with aerial baiting. It has now decided to make cash grants to the Native Dog Destruction Associations in its District, to carry out approved work.

The dingo problem is extremely difficult, and the Boards are commended for their efforts to work out new means of attacking it.

Travelling Stock Reserves.—The Pastures Protection Field Officer inspected 57 reserves in the Forbes District. He also comprehensively inspected stock routes in the vicinity of the Keepit Dam.

The Pastures Protection (Amendment) Act, 1951, included a provision enabling Travelling Stock Reserves or parts thereof to be withdrawn from the control of Pastures Protection Boards on the recommendation of the Minister of this Department. Applications for revocations of parts or the whole of Travelling Stock Reserves dealt with from 7th December, 1951, to the 30th June, 1959, totalled 3,434. During the past year a further 303 applications were dealt with. Cases dealt with up to 30th June, 1960, and acreages involved are summarised as follows:—

	Reserves Number	Acreage
1. Recommended for withdrawal with consent of Pastures Protection Boards	1,955	130,410 (i)
2. Recommended for withdrawal without consent of Boards	425	57,409 (ii)
3. Referred by the Minister to Land Board for Inquiry, but not yet completed	Nil	Nil (iii)
4. Referred by the Minister to Land Board for Inquiry—		
(a) Land Board recommended part revocation	5	920
(b) Land Board recommended against revocation	7	519
5. Boards not agreeable to revocation—		
(a) Investigation upheld Board's decision	658	104,255 (iv)
(b) Recommended for re-investigation at later date	31	7,485 (v)
(c) Awaiting investigation	534	13,627 (vi)
6. Awaiting replies from Boards as to whether they are agreeable or otherwise to revocation	250	18,525 (vii)
	3,865	333,150

(i) This figure excludes the unknown acreage of 364 reserves.

(ii) This figure excludes the unknown acreage of 7 reserves.

(iii) The 12 reserves listed under this heading in the 1959 report were located in the Keepit Dam area and because of the urgency of the case were inspected by a Field Officer.

(iv) This figure excludes the unknown acreage of 59 reserves.

(v) This figure excludes the unknown acreage of 2 reserves.

(vi) This figure excludes the unknown acreage of 203 reserves.

(vii) This figure excludes the unknown acreage of 116 reserves.

The following figures indicate the position in regard to reserves during the years ended 30th June, 1959, and 30th June, 1960.

Period	Applications	No. of Reserves investigated by Field Officer
Year ended 30th June, 1959.	303 reserves applied for, and Boards indicated their objections in respect of 275 of them.	128
Year ended 30th June, 1960.	303 reserves applied for, and Boards indicated their objections in respect of 167 of them.	146

Prior to the 1951 amendment of the Act, fourteen Boards advised that they were agreeable to relinquish 128 reserves or parts thereof, comprising approximately 15,000 acres.

Staff Statistics—Pastures Protection Boards

Numbers	Year ended	
	30th June, 1959	30th June, 1960
Veterinary Inspectors—		
Appointed	4	Nil
	(inc. one acting)	
Retired	Nil	1
Resigned	3	5
Transferred	1	7
Secretaries—		
Appointed	5	5
Resigned	3	2
Retired	2	2
Rangers—		
Appointed	4	5
Resigned	4	3
Retired	1	5
Dismissed	Nil	Nil
Rabbit Inspectors—		
Appointed	5	21
Resigned	Nil	1
Retired	Nil	Nil
Dismissed	Nil	2

Industrial.—New awards were agreed upon for Veterinary Inspectors and Rangers and Rabbit Inspectors.

The Veterinary Inspectors were granted new rates operative from 1st December, 1959.

A completely new award was agreed upon for Rangers and Rabbit Inspectors. Previously only the Rabbit Inspectors had been covered by the award. The Rangers' employment and salaries had been covered by an administrative arrangement. The new award provided increased salaries for Rangers and Rabbit Inspectors. The award also provided for an equipment allowance, increased living allowances, and some minor variations. It operates for three years from 13th January, 1960.

Biometrical Branch

Summary of Main Services.—Staff of the Biometrical Branch provided advice to other investigators in the Department; on the design of experiments and their analysis and interpretation, and on sampling and survey methods and related problems. At the commencement of an investigation, the biometrician helps to clarify and define objectives, to select the precise questions to which answers are to be sought, and to decide the exact plans and procedure to be followed. On completion of the experimental work he is again available, to make statistical analysis of the data obtained. This analysis assesses the reliability ("significance") of results, as judged in relation to the measured variability of each particular experiment.

Advice was tendered this year on a wide variety of subjects. They included the design of fertiliser and other experiments with field crops and pastures; nutrition experiments with pigs; stocks and planting distances with fruit trees; poultry breeding; sampling methods with insects, pastures and crops; and the selection of sites for experiments, and the size and placement of plots in the field.

Statistical analyses of the results of experiments were carried out for numerous projects mentioned elsewhere in this Report of the Department.

The volumes of consulting work on design of experiments, and of computing work in analysis of results, both increased. This reflected increases in research staff throughout the Department.

Punch-Card Section in relation to Dairy Herd Recording.—The Hollerith Unit summarises the records from Herd Recording, both Group Herd Recording and Official Herd Recording. The latter has been undertaken progressively from January, 1959, to January, 1960. The whole of the numerical information is now processed on punched cards.

The State Summary of Group Herd Recording for 1958-59 covered some 49,500 recorded lactations.

Additional Hollerith equipment, ordered in September, 1958, came to hand. It comprised a second punch and a second verifier, in July, 1959; and a collator with counting feature, in November, 1959.

EXPERIMENT FARMS AND STATIONS BRANCH

Scope

Technical subject matter work of the various Experiment Farms, Stations, Substations of the Department is covered in the reports of the Divisions of Plant Industry, Animal Industry, Horticulture, Dairying and Science Services, and the Agricultural Colleges.

The Experiment Farms and Stations Branch is responsible for three aspects of Departmental activities:—

- Administration of Experiment Farms and Stations,
- Advisory service on farm mechanisation,
- Research on agricultural machinery.

Administration of Experiment Farms and Stations

The administration of Experiment Farms and Stations falls into two main categories—developmental and operational.

Developmental aspects include:—

- Provision of improvements and equipment to new Experiment Farms and Stations, to bring them into operation.

Added improvements and equipment to Farms and Stations already in existence, to improve their operation or widen their scope of activities.

Operational aspects include:—

- Provision of staff and labour to meet regular and short-term requirements.
- Repair, replacement, maintenance; and additions to existing improvements, facilities and equipment, including buildings, water supply, fencing, roads, machinery and vehicles.
- Provision of supplies for the activities of each Experiment Station, e.g. fuel, seeds, fertilizers, fungicides and general requisites.
- Attention to welfare, and conditions of living and employment of employees.
- Internal organisation for production of working necessities, e.g. fodder for livestock, and its distribution to institutions in less favoured localities or areas restricted in its production; seed for winter feed production; etc.

The overall purpose of the Branch is to provide reasonable facilities at all Experiment Farms, for efficient conduct of their research, administrative and educational functions.

In 1959-60, the Branch dealt with the needs of eighteen Experiment Farms and Stations. In addition, its responsibilities extended to supervision of the farm operations of the two Agricultural Colleges, Hawkesbury and Wagga, also the Glenfield Veterinary Research Station and this Department's Plant Industry Research Centre located on the Child Welfare Department's institution at Berry.

Developmental

Gosford Citrus Experiment Station, Narara.—A water storage dam costing approximately £8,000 was constructed on the Somersby Section. This is to implement an irrigation research programme on the Section, and provide for irrigation throughout the orchards. Also, an irrigation plant was supplied; and additional storage space for machinery and fertilizer, etc., was provided.

At Narara, a bridge was constructed over Narara Creek; for access to additional areas. Clearing of these areas proceeded, for extension of research thereon.

Leeton Experiment Farm.—The only part of this Farm not previously prepared for irrigation was levelled, and provision was made for delivery of water to it. An improved irrigation technique, by provision of efficient permanent water outlets, was planned; and their installation commenced. This will greatly reduce the labour required for irrigation.

Further subdivision was carried out. A new wool shed was constructed and equipped. This Farm has reached a very high standard of development. It may be regarded as a model of its type.

Lower Murray Research Station, Dareton.—More irrigation facilities were installed. This will enable proper maintenance of existing projects. It will also allow extension of the research programme.

New England Experiment Farm, Glen Innes.—A further Substation was established to facilitate the Tobacco Research Programme.

Also, water reticulation was extended to a previously unwatered half of the Farm. Already this has allowed preliminary research with beef cattle; and has enabled a start to be made on a farm management project.

Seven Hills Poultry Experiment Station.—Fifty portable poultry houses were supplied. Most of them will be used to extend the Station's work on the "range" system of poultry raising.

Supply of equipment from Departmental funds and from industry sources has expanded the research potential of this Station.

Wollongbar Experiment Farm.—Considerable development work was done on Duck Creek Substation of Wollongbar Experiment Farm. This Substation is on the lower level river soil and subject to tidal influence. It represents a class of soil which is extensive on the northern rivers of New South Wales. The work comprised a better drainage system, more clearing and subdivision, extended water reticulation, and improved pasture establishment.



Developing Poultry Research Facilities at Seven Hills Station

These new sheds comprising 48 sections of pens have recently been completed at the Poultry Experiment Station, Seven Hills, to assist replication of nutrition experiments. Genetics studies, basic and applied nutrition research, and egg-quality research are proceeding.

Alstonville Tropical Fruit Research Station.—On this new Station the first plantings of tropical fruit for experiments were made, and land was prepared for further plantings in the coming spring. Preliminary soil preparation occurred in other areas, to be brought into cultivation within two or three years.

Soil tests and a further survey were made, preliminary to a dam to impound water for irrigation and irrigation research.

More fencing, a domestic water supply, additional machinery storage space, access roads, erosion control measures on areas to be brought into cultivation, and increased farm machinery, comprised further developments at Alstonville.

Narrabri Experiment Farm.—Some 4½ miles of internal fencing was erected; for more efficient basic management of the property—incorporating livestock now placed on the Farm—and to permit intensified experiment work. The irrigable area was expanded, and 155 chains of new supply ditches was constructed. The main entrance roadway was formed and gravelled.

Further progress was made in mechanisation of this relatively new Farm.

Tamworth Agricultural Experiment Station.—Contracts in the sum of £59,000 were let for capital improvements, for further development of this institution for intensive research work. A glass-house and bird-proof enclosure were constructed; construction of an administrative building containing offices and laboratories progressed; and considerable fencing and road formation were done.

Research staff is increasing, and rapid development of the research programme is anticipated.

Other Experiment Farms and Stations.—Developmental work was carried out on a number of other Experiment Farms and Stations.

Operational

The Branch was associated with expenditure of £35,000, excluding Farm labour cost, in maintenance and upkeep of buildings, water supply, fences and roads, etc., at Experiment Farms and Stations.

Buildings.—The report of the Architects' Branch (page 23) details the work on buildings and water supply overseen by that Branch. In addition, the Experiment Farm employees

carried out other maintenance of this nature, under the Manager's supervision; including cementing of shed floors at Temora, Cowra, and Gosford, sheep yards at Leeton, painting of sundry buildings, repairs and extension of water supply as at New England, Duck Creek, Cowra, Condobolin, Gosford and Trangie, excavation of a water storage tank at Temora, and so on.

Fencing.—Approximately £6,700 was allocated for purchase of fencing materials for Experiment Farms and Stations. Fencing done was approximately as follows:—

	Miles
Renewal of boundary fence	8
Renewal of and new subdivision fencing	15
Repairs to subdivision fencing	13

Some fencing was erected at all Experiment Farms and Stations, but major work was carried out at Trangie, Condobolin, Leeton, Wollongbar (Duck Creek Substation), New England and Narrabri.

Roads.—Road maintenance is a regular feature of Experiment Farms and Stations management. This year the road work comprised 3 miles of roads formed and 2 miles gravelled. The work was mainly at Grafton, Alstonville, Trangie, Tamworth, and Narrabri. It included installation of culverts, and, at Gosford Citrus Experiment Station, a bridge to span a large creek.

Erosion Control.—Constant attention was given to soil erosion control measures at all Experiment Farms and Stations. At Gosford Citrus Experiment Station—a further 10 acres was laid down to a mechanical control system. Considerable maintenance was carried out on existing works at Tamworth and Bathurst.

Drainage.—The drainage work was mainly at Wollongbar (Duck Creek Substation) and the Gosford Citrus Experiment Station (Somersby Section). At Duck Creek it was to remove excess water and control tidal influence. At Gosford it was tile draining in the orchard areas. Minor drainage work was done at other Farms.

Some 38 chains of new drains was dug, 200 chains was cleaned, and 260 chains of tiled drains was laid.

Soil Fertility.—Measures to maintain soil fertility were taken at all Experiment Farms and Stations; primarily by crop rotation, including pasture phases. On those Farms where orchards are important, green manure crops were used.

Some 400-450 acres of lucerne and 200-250 acres of improved pasture were sown for soil fertility maintenance, and provision of feed.

Irrigation.—Further development of irrigation occurred at Narrabri Experiment Farm. There, 140 chains of channel was cleaned, 155 chains of supply ditch was constructed, and land was levelled for gravitational irrigation.

Work proceeded in the newly-planned area of 500 acres on Yanco Experiment Farm. Work done at Leeton Experiment Farm is mentioned earlier in this report. Preparations for installation of irrigation systems at Gosford Citrus Experiment Station and Alstonville Tropical Fruit Research Station have also been mentioned earlier.

Fodder Production.—A good cereal grain harvest produced sufficient grain fodder to meet the needs of all Experiment Farms and Stations for 1959-60.

Despite a period of hand feeding at a number of Farms, fodder and stocks at Experiment Farms at 30th June, 1960, comprised 1,865 tons of hay and other roughage, and 30,080 bushels of grain. The quantity in storage would meet the immediate fodder needs of the Farms and would feed the stock for a lengthy period of drought. The estimated value of fodder in reserve was £33,610.

Some 316 tons of lucerne and pasture hay, and 10,764 bushels of grain were transferred from cereal-producing Experiment Farms and Stations to other establishments where fodder conservation was limited by experimental activities, other projects, or climatic conditions. Estimated value of fodder transferred was £12,000.

In this, as in previous years, this fodder was produced in excess of the domestic requirements of some Farms. Sowing arrangements for this year specifically aimed to satisfy the fodder needs of all Experiment Farms and Stations.

Seed Production.—It was considered unnecessary to continue using costly Foundation Seed for fodder production, green feed production, and green manure crops. Accordingly, arrangements were made for cereal-producing Farms to grow their own seed requirements annually; and to aim to produce an excess of fodder sufficient to meet the needs of non-cereal-producing Farms, Stations, and Colleges. These arrangements will reduce expenditure in Foundation Seed production and save freight that was involved in transferring Foundation Seed. Some 3,000 bushels of seed are used annually.

Livestock Management.—Considerable interchange of livestock occurred between Departmental establishments. This was for four purposes: firstly, to meet research needs; secondly, to relieve stock numbers and thus reduce the use of stored fodder, where adverse seasonal conditions prevailed; thirdly, to utilise excess growth on those Farms where more favourable conditions were experienced; and fourthly, to supply meat for the Agricultural Colleges. The latter three measures are financially significant; e.g., 134 head of cattle, valued at £4,900, and a large number of sheep were transferred to Agricultural Colleges for food.

Farm Machinery.—Approximately £19,000 was spent to provide this type of equipment. This sum was distributed in three directions, roundly as follows: machinery for general Farm use, only remotely associated with research work, £2,900; machinery employed in general Farm work and research work, £12,200; and machinery used specifically for research work, £3,900.

Some major items of plant provided comprised seven tractors, one rice header, one rice sheller, three rotary hoes, one scarifier, one side-delivery rake, one pick-up hay baler, three combines, three trailers, two silos, two electric welding machines, five scales, two disc harrows, one disc plough, two land levellers, two power mowers, three rotary slashers, one separator, and one drain cleaner.

Estimates from all Experiment Farms for 1960-61 have called for equipment to the value of approximately £54,000. On no occasion has a sum in excess of £16,500 been allocated from Consolidated Revenue Fund for the purchase of Farm plant for Experiment Farms and Stations.

Fifteen of the fifty-three tractors located on Experiment Farms have exceeded their economic life of 10,000 operational hours, but funds at the prevailing rate of appropriation permit the purchase of only four to six tractors per year. Provision of plant and equipment for research work on the Farms and Stations is seriously hindered whilst the appropriations do not cover the replacement needs of basic Farm plant.

Advice was given to the following Departments and instrumentalities in the purchase of machinery and plant for institutions under their control:—

Department of Education,
Department of Public Health,
Child Welfare Department,

Department of Tourist Activities and Immigration,
New South Wales Milk Board,
Government Stores Department (in determination of requirements of other Departments).

Motor Vehicles.—Six utility trucks were purchased, to a total value of £5,930.

It is a responsibility of the Experiment Farms and Stations Branch not only to recommend the placements of new vehicles at Experiment Farms but to take delivery—for checking—of all new vehicles supplied to the Department. These responsibilities were fulfilled.

The Branch also inspected all Departmental vehicles attached to Head Office; to determine any necessary repairs, and to certify vehicles after repair work had been completed. This work included inspection for registration of city vehicles and those at some country centres.

General Equipment, Materials, etc.—Timely supply of a wide range of general stores, items of minor equipment and services to the Experiment Farms and Stations was supervised. An expenditure of £50,000 for these items was involved. In general the requirements were expeditiously met.

Surplus stores at Departmental institutions were re-distributed, to an estimated value of £1,200-£1,250, reducing expenditure on new items and obviating clerical work that would otherwise be involved in checking and recording surplus store items. Some £275 worth of stores were offered for transfer to other Government Departments.

Communications.—Internal telephone communication systems were installed at the Trangie and Yanco institutions and phones were supplied to eleven other establishments.

Labour.—The Branch supervised the allocation of labour, regular and temporary, for efficient working of the Farms and Stations. As usual, there was some replacement of regular employees. Casual labour for seasonal work was employed at a cost of £10,000.

Advisory Service on Farm Mechanisation

Agricultural Engineer Appointed.—Mr. J. G. Drever, B.E. (Civil), A.M.I.Mech.E., A.M.I.A.E. (Aust.), was appointed Agricultural Engineer in January, 1960. He is to develop a Farm Mechanisation Advisory Service to farmers.

Mr. Drever travelled throughout the greater part of the agricultural area of the State making contacts; and paid particular attention to development of liaison with machinery firms both in the city and in the country.

He tended to the public by correspondence, telephone, personal discussion, lectures to farmer meetings and field days, newspaper items, radio broadcasts, and prepared articles for the *Agricultural Gazette of N.S.W.*

MECHANISATION VAN—MOBILE DEMONSTRATION UNIT

The Mobile Mechanisation Van, directed by the Branch and financed by the Commonwealth Agricultural Extension Grant, was located at Tamworth and operated in the Northern Region. It also operated in the adjacent North-western and Mid-coastal Regions.

Public demand for the demonstrations was good and is increasing. The demonstrator gave 46 lectures, attended 13 field days, participated in four machinery maintenance schools, conducted 14 film evenings, and visited 58 farms to give advice on farm machinery maintenance. He also prepared 14 publicity statements and delivered 12 radio broadcasts.

A new van was purchased with funds from the Commonwealth Grant, to modernise the unit and increase the efficiency of this extension work.

Testing Agricultural Machinery

The Branch does not engage extensively in experimental work. However, it tested all agricultural machinery supplied from funds provided by the Commonwealth Government through the Commonwealth Agricultural Machinery Research Vote and also for some items supplied from the Commonwealth Agricultural Extension Grant. Nine machines were re-tested and two new machines were tested in 1959-60.

Liaison with Subject-Matter Divisions

The Experiment Farms and Stations Branch maintained close liaison with the Divisions of Plant Industry, Animal Industry, Horticulture, Dairying, and Science Services, and with the Architect's Branch throughout the year.

Professional staff is provided for the Farms, Stations, and Colleges by the subject-matter Divisions.

Assistance was given to the Commonwealth Department of Primary Industry in production of a film for extension service on the maintenance of hay balers.

DIVISION OF PLANT INDUSTRY

Staff

Totals.—At 30th June, 1960, the total Divisional establishment of professional officers was 104, with nine positions vacant. Six university graduates and three Agricultural College diplomates were recruited. Losses due to resignations were four graduates and three diplomates; and one graduate was transferred to another Division. Thus, a net gain of one in the Divisional staff.

Four positions were transferred from the Division of Plant Industry establishment to that of the Agricultural Research Institute, Wagga; and four new positions were established.

Agronomists at Experiment Farms/Colleges.—Two Experiment Farms or College Farms have six agronomists; three have four; one has three; three have two; and five have one.

In addition, there are now four District Research Agronomists; one each at Berry, Inverell, Maitland and Taree; and a Supervisor of Dairy Industry Research (North Coast). The alterations in Experiment Farms staffing, as compared with twelve months ago, were caused by staff shortages and the necessity to fill new positions urgently.

Trends in Research; Decentralised Officers

Supervisor of Dairy Industry Research (North Coast).—This is a newly established position with headquarters at Lismore. It is expected to lead to better co-ordination of pasture research in particular, on the north coast. The position was made possible by assistance from the Dairy Industry Research Fund. The Supervisor's salary is paid from this Fund.

Mr. W. J. Hudson, former pastures research agronomist, district agronomist, and Wollongbar Experiment Farm manager, has been appointed.

District Research Agronomist Position at Taree.—A District Research Agronomist was appointed to Taree, to conduct pastures research in the Manning River area. This position was established under agreement with Manning District Agricultural Research Council. The Research Council has agreed to provide financial support for a period of five years, to the extent of £2,500 per annum.

Projects have been initiated on several properties, following discussions between the Department and the Research Council.

District Research Agronomist Position at Inverell.—Following the appointment of a Research Agronomist, black-soil scarab investigations were commenced in the Inverell area.

An extensive species-testing programme has been initiated. *Sorghum almum* and lucerne have further demonstrated their potential as pasture species capable of withstanding the grubs' attack. Insecticide trials, and cultural trials with crops and pastures, have also been established.

Extension Agronomists

Totals and Movements.—There are thirty-five established district agronomist positions. Two of the positions are vacant; Bathurst and Gunnedah. At Gunnedah an agronomist is in training under the supervision of the Regional Supervisor, formerly Gunnedah district agronomist.

Coonabarabran district had been vacant for twelve years, and for that period had been included in the Mudgee district. Now it has been re-approved as a separate district and a district agronomist has been appointed, with the Shires of Coonabarabran, Coolah and Merriwa as his territory.

Development of Coleambally Irrigation Area has required the district agronomist at Griffith to devote a lot of time to assisting the Water Conservation and Irrigation Commission with the design of farms, and to advice for new settlers. To relieve the Griffith district agronomist and at the same time receive valuable training in extension methods, an additional agronomist has been appointed to Griffith to assist in general district duties.

The C.S.I.R.O. at the Research Station at Deniliquin has developed an important "dissolved gypsum" technique, for application of gypsum in irrigation water to some of the more difficult Riverina clay soil types. It is important in pasture establishment, and extensive areas are concerned.

To speed up the demonstration of the new technique to farmers, an additional agronomist has been appointed to the area. He is working under the supervision of the Deniliquin district agronomist and maintaining close liaison with the C.S.I.R.O. His work comprises demonstrational and observational trials over a large area of the Lower Murray irrigation districts.

Queanbeyan district, vacant for over two years, has been filled as from February, 1960, by the appointment of a district agronomist.

There was an improvement in the staff position; but there is an acute shortage of suitably trained staff, due to resignations or to transfer of officers to other duties. It is apparent again that the pool of younger officers is insufficient to maintain a full complement of trained staff.

In-Service Training.—During the year a number of young agronomists sited at Experiment Farms/Stations and Colleges received training in extension methods to help fit them for ultimate appointment to a district.

An "Irrigation Refresher School" held at Yanco Experiment Farm was attended by three district agronomists.

The "Extension Service/Methods School" at Newport in March was attended by eight agronomists; two district agronomists and six agronomists from Experiment Farms/Stations.

Extension Activities

Factors Affecting.—Better office accommodation, in-service training, provision of more extension-aids equipment, and the help of field assistants and Regional publicity officers, contributed to improvements in effectiveness of the advisory services.

Moreover, closer association with officers of other sections of this Department, the Departments of Agriculture of other States, the C.S.I.R.O., the universities, and the technical and semi-technical sections of commercial organisations affecting agriculture, has been valuable.

Demand for the services of district agronomists has increased and is beyond the present staff resources of the Department to satisfy.

Mass and Group Media.—Apart from individual farmer contacts, and a great but unknown number of group contacts of informal character, in the field, the 34 district agronomists participated in some 250 named Field Days with an overall attendance of 16,000 farm people. They also attended 280 named meetings, with an overall attendance of some 8,000. Agronomists' radio broadcasts exceeded 500, and their publicity notes supplied to the press totalled 670. Agronomists' monthly reports exceeded 400, and a majority of these were published, in full or in part, by various provincial newspapers.

Farm Plots.—District agronomists' establishment of more detailed trial work on private properties in the form of "U.P.S.E.T." trials with pastures, "W.U.F.T." trials with wheat, and "P.U.F.T." trials with potatoes, required a considerable amount of their time to be given to supervision. On the other hand, the plots and their results have proved particularly valuable as extension aids.

Experiments and demonstrations with crops and pastures, and seed-increase areas, exceeded 1,500; an average of 46.5 for each of the 33 districts staffed throughout the past year.

Seed Schemes, and other Regulatory-type Work.—Pasture and crop certifications under Registered Seed Schemes, inspection of other Government institutions, applications by farmers for assistance under the Farm Water Supplies Act, Land Settlement matters, and many other and varied problems arising from Local and semi-Governmental bodies, required and received district agronomists' attention.

Agricultural Extension Grant and Dairy Industry Extension Grant

Subsequent to the introduction of uniform pasture, cereal and potato trials, for which A.E.G. funds were available only to a limited extent, the number of new demonstrations commenced under A.E.G. were restricted. Demonstrations commenced in former years were continued.

District agronomists assisted with pasture and silage demonstrations conducted with Dairy Grants funds.

Field Assistants.—Field assistants, a total of twenty-eight, with transport, made available on funds from the Commonwealth Agricultural Extension Services Grant and Dairy Industry Efficiency Grant, materially assisted district agronomists in the conduct of demonstrations and other field duties.

Plant Introductions and Exchanges

Introductions during the year totalled 537, compared to 386 in 1958-59. Cotton introductions totalled 85, pasture species 80, and dent maize 45, with appropriate numbers for most other crops.

The fact that 85 cotton varieties were introduced this year, as against only nine in the previous year, indicates something of the degree of acceleration in the cotton research programme.

In addition to introductions made by direct contact with overseas authorities, the Division received by donation a collection of over 1,000 linseed varieties from Meggitt Ltd.

Many samples of seed of crops and pastures were supplied to other countries, in reply to numerous requests.

Plant Industry Officers' Regional Conferences

Division of Plant Industry Regional Conferences were held at Condobolin, Hawkesbury College, Glen Innes and Tamworth. In the past, Regional Conferences of Divisional officers were conducted at approximately two-year intervals; at each Experiment Farm and College. The frequency of such conferences has now been reduced, by establishing three-year intervals per centre.

Fertiliser Trends

Superphosphate remains the dominant fertiliser used in New South Wales. There was some increase in use of nitrogenous fertilisers in various forms; sulphate of ammonia, nitrate of soda, urea, and calcium ammonium nitrate for special purposes. Potash usage, though still minor, attracted more interest.

Gypsum on the Increase.—Increased quantities of gypsum were used as a source of sulphur, and to correct physical properties of difficult clay-soil types under irrigation.

Superphosphate Sales Increased.—Despite falling farm incomes, use of superphosphate increased. Sales for 1959-60 approximated 370,000 tons; an increase of about 100,000 tons on the previous year. However, by comparison with usage in Victoria, Western Australia, and South Australia, the N.S.W. consumption is relatively low.

Demand for molybdenum-superphosphate and for sulphur-fortified superphosphate increased.

Price of Superphosphate Lower.—The price of superphosphate at the works is £10 10s. per ton in bulk; a reduction of 9s. per ton in the past twelve months. There is, further, a discount of 10s. per ton when delivery occurs in the off-peak period—July to October.

Superphosphate Bulk Handling Increased.—Handling of superphosphate in bulk (and the development of a Group Plan for contract-spreading of super from the air) increased significantly. In 1958-59, some 45,000 tons were handled in bulk. In 1959-60 the figure increased to 120,000 tons.

Group Plan for Aerial-spread of Super.—Some 90,000 tons of superphosphate were spread by air under the Group Plan, in the first year of the Plan's operation. Spreading by plane cost approximately £3 15s. per ton, dependent on area of operation.

The Group Plan, organised by firms distributing the fertiliser, is designed to spread their sales—and assure aerial operators a continuity of work—over the year, on a programmed basis. Aerial topdressing increased.

Crop, Pasture and Fodder Competitions

The Department continued to co-operate with the Royal Agricultural Society of N.S.W. in the conduct of Crop (Wheat and Maize), Pasture and Fodder Competitions.

Some years ago the services of agronomists as judges of competitions organised by the local associations were withdrawn. This year, representations were made by the Royal

Agricultural Society to the Minister, and an agreement was reached whereby agronomists, under certain conditions, would again judge Wheat Crop and Maize Crop Competitions in 1959 and 1960.

Pasture and Fodder Competitions continued to create interest. They are designed in a way to place stress on the farm programme approach. Thus they have special value in the present-day trend of extension work.

Advice on Flood Control and Mitigation

The principal Agronomist (Extension) represents this Department in the Committee of Advice on Flood Control and Mitigation. This year the Committee considered Walgett Shire claims for assistance to enable flood mitigation work to proceed, to protect the town of Walgett. In the light of an inspection of the area, the Committee has made recommendations for consideration at higher levels.

Fodder Conservation Trends

Landholders, in general, benefited from their improvement of fodder reserves in the previous year. Supplementary feeding of stock was necessary over extensive areas of the State, and seasonal conditions did not favour accumulation of reserves.

Growing and storage of oat grain is still regarded as the most economical means of fodder conservation. Increased areas of oats were sown for this purpose.

Pastures this season did not produce the surplus growth needed for haymaking. Much of the hay conserved was made from cereals and lucerne.

Because of the costs of storing baled hay there was a trend towards storage of loose hay, for consumption on the property. Newly available machines facilitate this. In some areas there was a reversion to harvesting with the binder, and storage as sheaf hay.

Silage-making gained further momentum; mechanisation and better machines were largely responsible.

A new method of making silage was developed, and the term "vacuum silage" was commercially coined. This new method comprises placing a plastic dome over the freshly stacked green silage material, sealing to make it airtight, then, with a vacuum pump, withdrawing the air through a valve. It is a very easy means of making silage, and the results are being observed with interest.

Extension officers encouraged the conservation of fodder by carrying out demonstrations, and providing advice and assistance on all facets of this segment of a farm's management and development programme.

Although fodder reserves were heavily depleted by the call for supplementary feeding of stock in this year's conditions, requests for advice increased. The requests exceeded those received in the previous year.

Assistance to War Service Land Settlement

War Service Land Settlement work was on a reduced scale.

One Acquired (Ballot) Estate was sub-divided into thirteen farms. No estate inspection was made with a view to purchase for settlement. The special agronomist associated with the work accompanied the Closer Settlement Advisory Board on the inspection of three already-settled estates where some of the settlers were not doing as well as anticipated.

District agronomists gave considerable help to soldier settlers, with advice on the establishment and development of holdings.

A comprehensive field day was arranged on the somewhat isolated Sylvia Vale Estate in the Crookwell district. This was as soon as the settlers entered into occupation. Local officers of the P.M.G. Department, Education Department, Soil Conservation Service, Forestry Commission, County Council, and Shire Council attended. Arrangements were made for provision of mail and telephone services, a school, electricity supply, and attention to the road leading to the Estate. Information about this Department's agricultural extension services was given.

Acquisition of further land for closer settlement under the War Service Land Settlement Scheme ceased in New South Wales at the close of this fiscal year.

Pastures Section

Pasture Conditions.—Most coastal districts had one of the best spring and early summer periods on record, and conditions were similar on the northern and central tablelands. The southern tablelands, slopes and plains had a dry season.

Nineteen Pastures Protection Board districts were declared to be drought areas. They were in the south-western slopes, Riverina, north-western slopes and plains districts, and in parts of the Western Division.

Early autumn was dry in most of New South Wales; and resulted in poor autumn pasture-sowing conditions. Good late rains on the southern tablelands and south-western slopes, and in the Riverina, hindered late pasture sowings; and they came too late to improve materially the winter pasture prospects.

Acreage of Sown Pasture.—Sown pasture acreage in 1958-59 was 9,080,000 acres; 158,000 acres less than in 1957-58.

The decrease was caused by increased wheat sowings, after a pasture phase of lucerne or sown pasture. It is also related to an increasing thistle and weed problem on "old" pasture areas; and the need to make more economic use of the soil fertility built up under subterranean clover and lucerne-based pastures.

Lower wool prices also contributed to a slowing down in pasture sowings, which are now about 200,000 acres per year. Acreage of *Sorghum almum* has rapidly increased. It now approximates 500,000 acres in New South Wales.

Pasture seed sales in the 1960 autumn indicated considerable pasture sowing activity in coastal and tablelands districts, but reduced sowings in western slopes and southern inland areas.

PASTURE IMPROVEMENT TRENDS

Aerial Topdressing.—The rapid increase in aerial topdressing of pastures, with superphosphate, sulphur-fortified superphosphate, and gypsum, was notable.

In 1949, the quantity of superphosphate spread by aircraft was only 100 tons; 1952, 2,500 tons; 1956, 25,000 tons; 1958-59, 35,000 tons; and 1959-60, 110,000 tons.

Clover (and grass) seeds were overseeded with approximately 20 per cent. of this tonnage, and considerable acreages were seeded in independent operations using light aircraft.

It has been estimated that an additional 14,000,000 acres in New South Wales are adapted to improvement by aerial seeding and topdressing; hence special interest in this rapid increase in the tempo of aerial pasture improvement during 1959-60.

EXTENSION SERVICES ON PASTURES

Individual advice, plot demonstrations and field days in connection with pastures continued to occupy a major place in district agronomists' activities.

A noteworthy feature this year has been the keenness of enquiry by farmers and graziers into farm management problems and the economics of the various operations.

An increasing tendency to approach livestock feeding programmes on a fully-planned "feed year" basis is noted; with due attention to better utilization of improved and native pastures. Farmers' immediate interest in possible improvements by local application of recent research findings has grown. This trend in farmer extension needs has been met in part by the U.P.S.E.T. series of Departmental extension trials. These have made good progress since their introduction in autumn, 1959.

The U.P.S.E.T. (Uniform, Pastures Survey and Extension Trials) technique, involving "pre-packaging" of each trial, has resulted in four times as many trials being laid down by district agronomists, in each of the two years it has been in operation, by comparison with the former type of "farmers' experiment" designed by the local district agronomist and not "pre-packaged" by head-office arrangement. In addition, there has been a great increase in information, as yielded by the pre-packaged U.P.S.E.T.

Progress results indicate that this extension technique facilitates more precise recommendations to farmers in problem areas; and, also, will put the spotlight on areas and problems requiring more research into pasture species, establishment, and nutrition.

An additional 177 fertilizer trials, dealing mainly with superphosphate and other sulphur and phosphorous fertilizers, and 162 pasture species trials, were laid down.

Many of the added species trials were sited in coastal districts, to test out a range of promising sub-tropical legumes and grasses for "feed-year" use in coastal dairying and beef-raising areas.



Spreading Superphosphate from the Air

Rapid increase of the practice has been a feature. As against 100 tons superphosphate dropped aerially in 1949, the tonnage was 110,000 in 1959-60.

The trend is important. About 14 million acres in New South Wales are adaptable to improvement by aerial seeding and topdressing.

Pastures Research

Pasture research was continued at the two Agricultural Colleges, the Research Stations and Experiment Farms, and by district research agronomists in the north-west (Inverell), central coast (Maitland) and lower north coast (Taree) districts.

The research covers many aspects of pasture establishment, nutrition, management and utilization.

PASTURE SPECIES RESEARCH

More suitable species are the key to more effective pasture improvement in certain areas, particularly the north coast and the north-west. They would also mean more production per acre and greater seasonal uniformity of production in other areas. Species work has therefore been given priority in these areas.

Sub-tropical Legumes, and Summer-growing Grasses.—The main development in species work over the past year was in this field, both for the higher and the lower rainfall areas in northern New South Wales.

The interesting species include *Phaseolus lathyroides*, *Siratro*, *Dolichos lab lab*, *Dolichos axillaris*, *Glycine javanica* and *Desmodium uncinatum*.

Glycine javanica, a creeping sub-tropical legume, has been recommended, after several years of research, as a summer-growing forage and pasture plant for particular conditions on the north coast.

Of the summer-growing grasses, Buffel Grass (Molopo, Biloela and American T.4464 strains), Guinea grass *Panicum coloratum* var. *Bambatsi*, and Katambora Rhodes grass are showing a lot of promise for the north-west. In the Gundah district, 100 acres of Molopo Buffel were established as a seed production area; but, due to dry conditions, no seed was produced.

Seed production difficulties have hampered research with tropical and sub-tropical legumes. Most sub-tropical legumes set their seed and shatter immediately, or ripen unevenly over a long time. Thus, mechanical harvesting is handicapped.

PASTURE ESTABLISHMENT RESEARCH

Because so much of the steadily increasing acreage of sown pastures in New South Wales involves the establishment of pasture clovers into formerly native grass-dominant pastures carrying little or no legume, research in recent years has been concentrated on clover establishment problems.

These have been concerned in the main with techniques of *Rhizobium* inoculation, the development of peat and "freeze-dried" *Rhizobium* cultures, the place of lime-pelleted seed, use of lime-sulphur phosphate mixtures, fertilizer use in establishment, fertilizer placement, and lime use at higher rates.

The problems of securing nodulation and establishment of clovers and grasses when aurally seeded still present difficulties.

Valuable information has come from research in the central tablelands in respect of the introduction of improved pasture species into non-arable, serrated tussock-infested lands. The work has shown that May, June and July are the best months to establish aurally-seeded pastures in uncultivated land; and that red and white clovers establish more readily than subterranean clover under these conditions.

Under irrigation conditions, at Leeton, it has been shown that *Phalaris tuberosa* will establish more readily when sown alone, without a nurse-crop. The legume is introduced subsequently, by over-seeding. White clover was found to have a more detrimental effect than subterranean clover, in establishing *Phalaris tuberosa*. This is due to competition between the clovers and the "shy" *Phalaris tuberosa* seedlings.

PASTURE NUTRITION RESEARCH

Most of the nutrition investigations have been in the survey of mineral nutrient deficiencies of virgin soils now being sown-down, sodseeded, or aurally-seeded to pastures.

Work to determine the present nutrient status of soils with a long history of fertility build-up through subterranean clover (and lucerne) and superphosphate is also proceeding.

Phosphorus and sulphur have been shown to be the most widespread deficiencies. Molybdenum is required also, in some cases—especially in coastal areas.

Potassium deficiencies have been shown in the case of vetches on some far North Coast soils, especially in paddocks with a history of constant cropping.

Pot trials in the glasshouse at Hawkesbury Agricultural College have been a valuable adjunct to field research. The past year's work included a routine pot-survey of the mineral nutrient status of a number of soils in the year's field fertilizer trials.

Soils under special study this season were sampled from County Cumberland, Maitland, Taree, Lismore, Rylstone, Coleambally, and Cowra. Other soils, from Wagga, Pilliga, Hanging Rock, Tamworth, and Deepwater, were tested.

Some specific investigations were: molybdenum "carry-over" into seed maize; the effects of black-soil scarab on soil fertility; size grades in relation to superphosphate response; lucerne-growing problems at Taree, Cowra, Agnes Banks, and Pitt Town; the phosphate growth-response curves on twelve different soils; and the nature of some lime responses, and lime depressions.

Good progress has been made in studying the economics of nitrogen fertilizer use on pastures and forage crops. Nitrogen trials were continued at Berry, Wollongbar Experiment Farm, Hawkesbury Agricultural College, New England Experiment Farm and Leeton Experiment Farm. The Chemistry Branch has closely co-operated, in protein analyses and nitrogen recovery studies.

Field fertilizer trials on pastures and forage crops continued at most of the Experiment Farms and Stations. They were given priority by research agronomists at Maitland, Taree and Inverell. Research at Walcha reached the concluding stages.

PASTURE MANAGEMENT AND UTILISATION RESEARCH

North Coast "Feed Year" Work.—A dairy production trial at Wollongbar demonstrated, in terms of increased butter production, the economy of including vetches in the dairy feed programme on the far North Coast. This trial was concluded to allow commencement of a more comprehensive "feed-year" trial, including vetches, subterranean clover, and summer legumes, supplementary to the basic *Paspalum dilatatum* dominant pastures of the Lismore area.

On the North Coast a modified "feed-year" pasture-forage crop series of demonstrations was implemented under the Dairy Industry Extension Grant. The aim is to emphasise the role of supplementary forage and fodder crops in dairy production, in conjunction with naturally occurring summer-growing pasturage and sown winter pastures.

Rate of Stocking Trial in Mid-west.—A "rate of stocking" trial was commenced at Cowra; comparing one, two, three and four ewes per acre on a round-the-year stocking basis, on a Wimmera-rye-subterranean clover-lucerne pasture. Effects are being measured in terms of wool and lamb production, and with due regard to the effect of stock on the pasture.

Management and Feed Economy, New England.—Work at Shannon Vale Nutrition Station continued to demonstrate the merits of properly managed and utilised sown pastures as a nutritional supplement to the native pastures of the granitic soils of this New England district. Special attention is being given to systems of pasture management and feed economy to meet the requirements of breeding ewes carried at high stocking rates.

Rate of Stocking Trials, M.I.A.—At Leeton Experiment Farm, in the M.I.A., rate of stocking trials were continued, with both beef cattle and breeding ewes. Attention is being given both to stock production per acre and pasture welfare.

Seasonal Production and Species Persistence.—"Miniature" pasture management trials at Hawkesbury Agricultural College compared the seasonal production, and persistency, of major pasture species, under two intensities of defoliation and at three levels of nitrogen fertilizer.

Cattle Grazing of Summer Species, North Coast.—Grazing trials with beef cattle continued at Grafton, to test the value of various summer legumes and other summer species under observation there, in a "feed-year" plan.

Seed Testing Laboratory

General.—The number of samples received for testing was normal but, for staff reasons, it was not possible to test all samples. About 180 were sent to New Zealand for testing.

The Seeds Officer was re-appointed to the Purity Committee of the International Seed Testing Association; the Germination Committee of the same Association; and the Editorial Committee of the Seed Testing Newsletter.

Assistance was given to officers of the Universities of Sydney and New England, the Police Department, and the Forestry Commission.

A course in seed testing was given at the Technical College, Ultimo, by the Seeds Officer, to seventeen students, representing six of the Sydney seed firms.

Seed Certification.—Seed certification schemes for subterranean clover, *Phalaris tuberosa*, barrel medic 173, perennial ryegrass, and white clover were continued.

The harvested amount of *Phalaris tuberosa* seed exceeded previous years' totals. This was in part due to exceptionally good seasonal conditions, and in part the greater number of growers harvesting seed.

Production of subterranean clover seed was 30 per cent. above that of the 1958-59 season.

Kangaroo Valley strain perennial ryegrass seed was certified for the first time. This year's production of perennial ryegrass seed, certified, was the largest for any one season.

The approximate production of certified seed in 1959-60 was: subterranean clover, 1,800 tons; *Phalaris tuberosa*, 100 tons; barrel medic 173, $5\frac{1}{2}$ tons; and perennial ryegrass, 30 tons.

Additional rules were included in the certification scheme to protect N.S.W. certified pasture seed from contamination with seed of the parasitic weed broomrape.

Seed cleaners were also required to keep records of all certified seed dressed. This materially assisted the seeds inspectors and certification officers to supervise disposal of cleanings from certified pasture seeds.

Revenue from the pasture certification schemes amounted to approximately £6,500, compared to £5,700 in the previous year.

Inspection of Stores.—The two inspectors visited 324 stores in country towns and 111 stores in the metropolitan area in the course of regulatory activities under the Agricultural Seeds Act and the Stock Foods and Medicines Act.

No legal proceedings were instituted, but some warnings were issued. These were for minor breaches of the Acts.

Most firms offered good quality seed for sale. Many seed-producing farmers have installed seed-cleaning machines on their properties, and are thus helping the Department's campaign for better quality seed.

Weeds Section

GENERAL

Interest of agricultural and industrial organisations and home gardeners in weed control was at a high level. This was shown by the demands for information and research, and by increasing sales of herbicides. The research results are being rapidly applied in some fields. This is specially so in the case of serrated tussock.

Current investigations on treatment of serrated tussock infestations on non-arable areas were directly responsible for aerial seeding of some 10,000 acres in the central tablelands alone this year.

Two new herbicides, CDAA and CDEC, were introduced to the Australian market, largely as a result of this Division's research. They are already being used by vegetable growers, particularly those in large-scale production.

Co-operation with Local Government Bodies.—Close association was maintained with the Department of Local Government and, in addition, both directly and through the Department of Local Government, with many Councils active in noxious plant control.

Recommendations were forwarded to the Department of Local Government for numerous changes in noxious plant declarations, and with regard to other administrative aspects of noxious plant control.

Close liaison was maintained with Shire, Municipal and County Councils and Pastures Protection Boards in connection with all aspects of weed control. Several of the "weeds" County Councils assisted the Department in conducting investigations. Some extension activities were co-operatively undertaken, including displays at country shows.

Funds from Department of Local Government to Councils.—The Government's grant to assist local Councils' control of noxious plant was increased by £5,000 to a total of £40,000. On a recommendation approved by the Minister for Agriculture, the grant was distributed as follows:—

	£
9 County Councils (comprising 35 Shires and 12 Municipalities)	23,750
53 Shire Councils	14,575
9 Municipal Councils	1,675

This increase in funds helped Councils to carry out a more effective weed programme. Once again it was noticeable that best results were achieved by the "weeds" County Councils.

Assistance to other Government Bodies.—Some research on control of aquatic weeds was initiated in co-operation with the Electricity Commission. Advice on weed control was given to the Departments of Railways, Public Works, Prisons, and Main Roads, and to the Housing and Forestry Commissions.

Liaison with Herbicide Manufacturers.—Close liaison was maintained with many herbicide manufacturers in co-operative investigations, and by way of special advice for use in their own farmer advisory activities. Many donations of herbicides for use in research work were received from manufacturers.

EXTENSION SERVICE IN WEED CONTROL

General.—District agronomists provided a great deal of advice on weed control to farmers and others. There was a strong demand from manufacturers, councils, farmers' organisations and, to a rapidly increasing extent, industrial bodies and others concerned in keeping non-agricultural land free of weeds.

"Weeds" Schools.—Special schools, on an Agricultural Region basis, for Council Weeds Officers, Pasture Protection Board Officers, technical representatives of manufacturers, and others concerned with the dissemination of weed control advice, were held at Tamworth, Lismore and Goulburn. These schools were most successful, and a major development in weeds advisory services.

Special Displays.—Displays of noxious weeds were promoted at a number of agricultural shows.

RESEARCH IN WEED CONTROL

Serrated Tussock.—Investigations have demonstrated:—

- (i) that serrated tussock can be killed with as little as 2.5 lb. per acre of dalapon and 6 lb. per acre of TCA, when applied at the optimum time of the year, with correct burning treatment. These low rates have not yet been recommended, but it is noteworthy that no so long ago 20 to 25 lb. of dalapon or 100 lb. of TCA were considered necessary;
- (ii) that the chemicals are best applied after the species for improved pasture have been sown and established;
- (iii) that competition from subterranean clover on non-arable areas over a three-year period can kill up to 50 per cent. of the serrated tussock;
- (iv) that control of serrated tussock on steep semi-arable areas can be carried out, with a crawler tractor and chisel "plough";
- (v) that aerial seeding of subterranean and white clovers when carried out from mid-May to early July in central tablelands districts has been most effective. Earlier sowings, previously recommended, are far less satisfactory, due to seedling mortality in the warmer, drier conditions.

These methods for treatment of serrated tussock areas have been rapidly adopted by some farmers. Arrangements were made in co-operation with the Upper Macquarie County Council for 10,000 acres on 200 farms to be seeded from the air this winter. This is a remarkable rate of adoption of research results. Unfortunately, however, it is necessary to record unwillingness or apathy of some farmers to adopt in respect of arable land the more effective methods of cultivation and sowing.

Herbicide Trials in Many Crops.—Herbicide trials were conducted by the Weeds Section in many parts of the State, particularly on the coast. Other trials were designed for and established by district agronomists, in areas that the weeds specialists could not get to.

The major part of the research programme was with vegetables, but work was also undertaken on weeds in pasture, flower crops, orchards, nurseries, and various non-agricultural areas.

Among vegetable crops, weed control trials were conducted on onions, beetroot, peas, beans, cabbage, cauliflowers, silver beet, lettuce, tomatoes, sweet corn, asparagus, carrots, pumpkin, cucumbers and rockmelons. CDAA and CDEC are now marketed here, largely as a result of this research.

In the floriculture sphere, trials were undertaken in gladioli and roses.

In respect of turf, work has been done on control of nut grass, oxalis, onion weed and onion grass. Amitrol has proved outstanding for these four weeds.

In co-operation with the Division of Horticulture, weed control research was done in vineyards, in peach and citrus nurseries, and in peach and citrus orchards.

Weed control in channels, ditches and drains, cemeteries and paths, and on industrial sites and roadsides have required trials leading to recommendations. It is evident that weed control in non-agricultural situations is in itself an important field for research.

Chemical Seedbed Preparation.—This was a new field of preliminary studies at Wollongbar Experiment Farm. Special attention has been given to the use of herbicides to facilitate establishment of summer legumes in an existing pasture. Initial results have been very promising.

Broomrape.—Broomrape, a serious parasite of subterranean clover, continued to spread rapidly in the Riverina. It has affected the subterranean clover seed industry. Preliminary studies have been made to determine the reasons for its rapid spread, and the possible methods of control. There are indications that control of skeleton weed and increased soil fertility may control broomrape.

Crofton Weed.—Studies in the use of herbicides for control of crofton weed have commenced.

Vegetable Section

POTATOES

Release of New Variety, "Murru".—The red-skinned seedling S2680, from Gold Coin x Saranac, was released to commercial growers as "Murru". It is more suited to tableland areas, and is expected to occupy a considerable acreage. It has some field resistance to early and late blight, and good resistance to common scab.

Breeding.—The crossing programme has been enlarged to use a wider range of parents; 260 crosses were made, giving a harvest of over 1,400 seed balls.

Female parents included Green Mountain, Onaway, Ontario, Virgil and Tawa from the U.S.A., also the local varieties Monak, Murru, Walanga, Mainguy and Adina, and some promising fourth- and fifth-year seedlings.

Male parents included Katahdin, B2368-4, Saco, Cherokee, Merrimack, B2067-52 and X927-3 from the U.S.A., Furor from Europe, and the local varieties Crana, Adina and S2856.

Some 15,000 seedlings were in the glasshouse. Promising lines were obtained from the crosses (B595-76 x Exton), (B595-76 x S2678), (1928 (e)2 x S2782), (Pungo x 58/3014) and (Sequoia x 58/3014).

Three thousand second-year seedlings were grown at the substation and 285 of them were selected as worth further trial. Good selections were made from (S2864 x Merrimack), (Delus x S2782), (Saco x S2782), (B922-6 x B2368-4), and from various crosses wherein B595-76 was the female parent.

From the 300 third-year seedlings grown, 100 selections were made. The more impressive of these came from (B595-76 x Adina), (B595-76 x Katahdin), and (Exton x Cherokee). Some attractive red-skinned lines were selected from (S2776 x B2368-4), (Crana x B2368-4) and (1928 (e)2 x B2368-4).

Eighty-one fourth-year seedlings were grown, and twenty-nine selections were made from them. Most promising were selections from (11-79 x Cherokee), (11-79 x B2368-4) and (Menominee x B2368-4).

In a preliminary yield trial of the more outstanding advanced seedlings, the best were three selections of the cross (Monak x 11-79), one from (46-43 x Awaba) and one from (S2540 x Adina).

Breeding for Disease Resistance.—Of lines tested by Biology Branch for resistance to late blight, thirty-four proved immune to the common blight races. Several thousand first-year seedlings were tested, by mass inoculation in the glasshouse at New England Experiment Farm.

Resistance to the blight was obtained from varieties such as 1521(c)3, 1928(e)2, 2079(ab)7 and 1664(a)6 from Scotland; B922-6, Merrimack, Cherokee and Pungo from the U.S.A.; Aquila from Germany; and several locally developed seedlings.

Near to 3,000 seedlings were tested for immunity to Virus X. Resistance, in all cases, was obtained from either Saco or B595-76, both varieties from U.S.A. From these came some very good lines when combined with Menominee, Exton, Saranac and 336-123. The latter is a sister selection to Saranac.

Potato Introductions.—Four new introductions were grown in quarantine at New England Experiment Farm. Of these, the red-skinned variety Norland, from the U.S.A., was very promising.

Of the earlier introductions the most outstanding was Merrimack. In the seed increase area at Orange, it produced a very attractive sample of uniformly sized white-skinned tubers.

Soil Fertility Demonstration Area, Guyra.—This work was concluded. Required knowledge has been obtained and adequately demonstrated to Guyra district potato growers. The high yields again showed the effect of a clover pasture phase on the fertility status of the potato soils. Highest yield from plots under the normal three-year rotation of oats, natural pasture and potatoes was 2.8 tons of potatoes per acre; whereas the plots in rotations including a pasture phase, yielded up to 7.4 tons per acre.

Fertiliser Trials.—At Guyra, the trial compared all combinations of sulphate of ammonia (none, 1 cwt., and 2 cwt. per acre), superphosphate (none, 3 cwt. and 6 cwt. per acre), and sulphate of potash (none, $\frac{1}{2}$ cwt. and 1 cwt. per acre).

Highest yield, 10.94 tons per acre, came from the plots combining 6 cwt. of superphosphate with 1 cwt. of sulphate of ammonia. Most noticeable effect was increase in yield with higher applications of superphosphate. Potash had no effect on the yields.

At Maitland, in a potato fertiliser trial, superphosphate gave a significant response. Highest yield came from the 8 cwt. level. Response to sulphate of ammonia was significant, but the average increase for each additional 1 cwt. of sulphate of ammonia was 1.48 tons per acre, in the absence of potash, and only 0.40 tons per acre with 2 cwt. of potash added. There was a significant interaction.

At Windsor, both superphosphate and sulphate of ammonia gave significant increases, but potash had little effect.

District Potato Variety Trials.—Nine named varieties and ten Departmental seedlings were seed-increased in the main testing ground at Orange, where variety trials were also conducted. Four new Departmental seedlings were included in the seed-increase plots. The U.S.A. varieties Pungo, Cherokee and Merrimack were also in for the first time.

In the variety trial at Orange, the seedlings S2770, S2854 and S2848 gave very good quality tubers, and higher yields than the standard commercial varieties Sebago and Sequoia.

At twenty-five centres, district variety trials were carried out. In coastal trials, the seedling S2770 continued to give very good results. It produced a higher yield of better quality tubers than the standard varieties Sebago and Exton. This seedling S2770 also gave very good results in tableland areas. It consistently produced higher yields of more attractive tubers than Sebago and Sequoia.

S2854 and S2845 also showed promise, while the newly released Departmental variety Murru showed to advantage in many districts.

In a trial on the central coast, Kennebec was outstanding in blight resistance, and the seedling S2854 also showed good resistance.

Potato Seed Certification.—The acreage submitted for certification, 1,560 acres, was comparable with that of the previous season, 1,572 acres. The number of growers, 155, decreased slightly from the 164 of 1958-59. Actual acreage certified this year, 1,489, showed an increase over the 1,366

acres of 1958-59. The 1959-60 acreage included 17½ acres of the new variety Murru, which has been accepted as approved seed. Of the acreage inspected, 4.5 per cent. was rejected, compared to 13 per cent in 1958-59.

Sprout Inhibitor Trial.—At Orange the usefulness of maleic hydrazide was under trial as a sprout inhibitor in potatoes in storage. Maleic hydrazide proved particularly effective when it had been sprayed on to the plants two weeks before flowering. At 5 pounds per acre it was as effective as at 10 pounds per acre.

TOMATOES

Breeding.—The breeding programmes continued at Hawkesbury Agricultural College and Yanco Experiment Farm. At Hawkesbury the aims are high yielding varieties resistant to disease, and improved varieties for glasshouse growing. At Yanco the emphasis is on production of a dwarf variety resistant to *Fusarium* wilt and good for pulping.

In the yield trial at Hawkesbury, good results were again obtained with the already released F1 generation hybrids, also the wilt-resistant cross Kokomo x Rouge de Marmande and a large-fruited, high yielding hybrid from Break O'Day x Daydream.

Two fixed crossbred lines in this trial were particularly good again in respect of yield, fruit shape, transport ability and disease resistance.

Eleven wilt-resistant selections of the cross Rouge de Marmande x *L. pimpinellifolium* A160, back-crossed twice, were grown and tested. Three selections were promising in the field and also under glasshouse conditions.

Six varieties, six crossbred lines, and four F1 generation hybrids were grown in the glasshouse for performance and leaf mould resistance tests. V-546 and its hybrid were highly resistant; lines 65 and 69 were fairly resistant; while the cross Break O'Day x Rouge de Marmande, and the line 1B, were outstanding for fruit shape and yield.

At Yanco Experiment Farm, crosses were made. Among the parents were Roma, Red Top, K.Y1 and 255. The F1 generation of 255 x Red Top and Roma x 255 looked promising. Several hybrids were tested for *Fusarium* wilt resistance and selections were made.

Tomato Introductions.—Seventeen varieties were introduced. The more impressive were Step 286 and Step 274 from Hawaii, and Indian River from the U.S.A. The variety V-548 from Ontario was outstanding under heated glasshouse conditions. It was also immune to the races of leaf mould existing here.

Tomato Variety Trials.—Grosse Lisse, Valiant and Urbana were the best yielding varieties at Bathurst Experiment Farm. Grosse Lisse and Valiant are still the best two varieties for the fresh market. Urbana is the best for processing. Hybrids H and I produced very good quality fruit but were not as high yielding as Grosse Lisse.

In a canning tomato variety trial at Yanco, M3 selection gave the highest yield, and selection 255 gave the highest percentage of first grade fruit.

Direct Sowing of Tomatoes.—At Yanco Experiment Farm direct seeding of tomatoes was under comparison with transplanting. The trial showed that yields were equally as good from direct sowing, provided the sowings were not made too late. Two advantages of direct seeding were: that continuity of supply can be better planned with direct sowing; and that there was less disease such as spotted wilt and late blight. A disadvantage was a more acute weed problem because of the longer period in the ground.

Tomato Growth Regulators.—Gibberellic Acid treatments on two varieties of tomato gave variable results. One application of 20 p.p.m., or one of 40 p.p.m., on Rouge de Marmande showed some promise only from the point of view of improvement in fruit shape.

Ability of the selective Gametocide FW-450 to induce male sterility in tomatoes was tested at Hawkesbury Agricultural College. The results were variable. There was some indication that at 0.15 and 0.20 per cent. it has some value.

BEANS

Breeding.—Bean breeding programmes continued at Hawkesbury Agricultural College and Yanco Experiment Farm.

The Hawkesbury programme aims to produce disease-resistant stringed and stringless varieties; and a bush field bean.

Selections of eight different crossbred lines in advanced generations were tested. Of these, two selections from Windsor Longpod x Brown Beauty and three selections from (Full-green x Brown Beauty) x (Brown Beauty x Little Navy) were promising for disease resistance and for agronomic quality.

Fixed lines No. 23 (Hawkesbury Wonder x Granda) and No. 42 (Hawkesbury Wonder x Tweed Wonder) continued to give very good results.

At Yanco, the programme to develop stringless dwarf pole beans suitable for canning was continued. Several F4 lines were grown.

Eight stringless crossbred lines were tested in a replicated randomised trial. The yields of six were significantly greater than the check variety.

At New England Experiment Farm, four bush field bean selections from the cross Granda x Little Navy showed promise because of their earliness and bush habit of growth.

Bean Introductions.—The stringless variety Garden Green from U.S.A. showed to advantage, for yield and quality. Of a number of lines of field beans introduced from Michigan, No. 3593 was outstanding. Lines 854 and 874 showed the same maturity and growth habit as Small White; but with the advantage of anthracnose resistance. Three edible, dry bean varieties were introduced from Italy, to be seed increased and tested.

Certified Bean Seed Production.—There was a further reduction in acreage of French beans submitted for certification. It was 199 acres; compared with 453 acres in 1958-59. Of the total, 165 acres were certified; compared with 270 acres in 1958-59. The decline in acreage has been due partly to over-production in Victoria, and partly to increased production in Queensland.

Bean Variety Trials.—At Terranora Demonstration Area, the highest yielding varieties in the series were Hawkesbury crossbred lines 44 and 42; Tweed Wonder; Wellington Wonder; and College Pride. Redlands Beauty from Queensland, and line No. 44, were best for disease resistance.

At Yanco Experiment Farm, in a canning bean variety trial, Seminole produced easily the top yield; 451 bushels per acre.

GARDEN PEAS

Breeding.—At Yanco Experiment Farm the breeding of mid-season maturing varieties continued. Several selections were made for earliness, pod-setting ability, and heat resistance. Some selections are in the F6 generation. Many are in the F5 generation.

At Hawkesbury Agricultural College the breeding programme continued, aimed at early and evenly maturing varieties with superior canning quality. Seed of Coopers Canner No. 75 was irradiated with Cobalt rays at various rates. This was in an attempt to induce useful mutations, particularly as regards resistance to *Mycosphaerella*.

Pea Introductions.—The more promising introductions, tested at Hawkesbury College, were 100L and 101L from New Zealand.

Canning Pea Variety Trial.—At Yanco Experiment Farm, ten varieties of canning peas were compared. The highest yielding was Hursthouse—4,478 lb. shelled peas per acre. New varieties Miragreen and Emerald showed promise. For the last three seasons Hursthouse and Dark Seeded Perfection have been the outstanding varieties. Pluperfect, in each trial, has been the earliest maturing.

Factors Affecting Maturing.—At various localities in Leeton district, experiments were conducted to ascertain the influence of varying soil types and differences in temperature on the maturing of peas. It was found that the difference in soil type and temperature between the various localities were not enough to hasten or delay the maturity of the peas.

Reliability of the heat unit system as a sowing guide, to obtain a continuous daily supply of peas at harvesting, was also tested. Application of the heat unit system at sowing time in this experiment led to a continuous daily supply of peas at harvesting.

ROCKMELONS

Breeding.—At Yanco Experiment Farm the breeding programme continued. It aims to produce varieties resistant to *Fusarium* wilt and to the strains of powdery mildew present in the M.I.A.

Crosses and selfings were made, using as parents P.M.R. Nos. 5, 6 and 45; Spartan Rock; Delicious 51; and Rio Sweet. Eleven hybrids and varieties were tested for resistance to *Fusarium*. Some of them showed promise.

In a variety trial at Wentworth, P.M.R. No. 45 was still the best type, mainly because of superior agronomic qualities.

Introductions.—Eight rockmelon varieties were introduced from the U.S.A. and tested at Yanco and Hawkesbury. The varieties Lj39794, Lj39810 and Lj39801 appeared most promising.

CAULIFLOWERS

Breeding.—At Bathurst Experiment Farm a breeding programme was initiated, to improve the resistance of first-early varieties to disease, and to obtain better protection of curds by more vigorous leaf cover. The variety Compinas from Brazil is early and it has vigorous dark green thick leaves. By crossing it with Russian 2A and the introduced early varieties, particularly the Danish strains, more vigorous, high yielding, early types are expected.

Fertilizer Trials.—At Bathurst Experiment Farm, in the first year of a fertilizer trial, sulphate of ammonia at 1½ and 3 cwt./acre significantly increased yields.

At Hawkesbury College, the effect of potash and boron on early cauliflowers were tested. The number of plants showing boron deficiency was highest where muriate of potash (1 cwt./acre) and sulphate of ammonia (4 cwt./acre) were applied without boron.

Introductions.—Of the various introductions, the most promising were Snowdrift, Idol, Selania, Early Snowdrift and Codania from Denmark; Danish Giant from British Columbia; and Compinas from Brazil. They are being seed increased. Other varieties with promise were Erfurt Early and Brio, both from Denmark.

BRUSSELS SPROUTS

Breeding.—At Bathurst Experiment Farm, the breeding programme is designed to produce early maturing hybrids with resistance to *Sclerotinia* rot. The most promising line so far tested is the F2 of the cross Fillbasket x Catskill. It is early, high yielding, and resistant to *Sclerotinia*.

Variety Trial.—At Yetholme, a trial of six named varieties and five F1 and F2 hybrids was conducted. Amager Improved, from Denmark, showed promise as a late maturing type of good yield and quality. The V.M.G. strain, from Arthur Yates & Co., also showed promise. It is a dwarf, with some resistance to *Sclerotinia*.

MISCELLANEOUS VEGETABLES

Capsicums.—Several capsicum lines, originally from Hungary, were grown and tested at Hawkesbury College. Three selections from them have shown promise; for earliness, high yield and good tolerance to bacterial soft rot and sun scalding.

Cucumbers.—The breeding line No. 108-3PF, from Michigan, possesses the gynomonocious habit. It has been sown to evaluate its potential and for crossing. Crosses have been made with the varieties Supermarket and Heinz Pickling.

Carrots.—The variety Autumn King, from Hurst & Sons, England, continued to show promise. At Bathurst Experiment Farm, it proved to be a vigorous high yielding variety, late maturing, and suitable for canning. The yield was near to 25 tons/acre.

Onions.—Five commercial onion varieties were in a trial in the Riverina, to test their suitability for pickling. Early Barletta produced a very good type of bulb for pickling. Early Lockyer also gave a good type of bulb. These two varieties also gave the best yields, with a seedling rate of 46 pounds/acre.

Turnips.—Cropping ability of seven varieties of swedes, and their behaviour under grazing, were under trial at Orange. The best results came from Pomeranian White Globe, White Stone, and Purple Top White Globe.

A lime and superphosphate trial with turnips was carried out at Grafton, to test the effect of the fertilizer on seed germination. Results indicated that seed sown in direct contact with the lime superphosphate germinated more readily than seed sown in contact with superphosphate.

Sweet Potatoes.—In three variety trials conducted on the central and the North Coast, Georgia Red, Australian Canner, Russian 85 and All Gold were best. Georgia Red was particularly attractive, and it yielded up to 9 tons/acre.

PLASTIC MULCHES

On Tomatoes.—At Terranora Station, black polyethylene mulching was used on trellissed winter tomatoes. Yield of the mulched plots was 29.9 per cent. greater than that from plots with normal cultivation. There was no difference between treatments in the first picking, but the fruit from mulched plots maintained size until later in the harvest period.

On Cucumbers.—A trial is proceeding at Hawkesbury College to compare the effect of polyethylene mulching on cucumbers with that of chemical weed control and normal cultivation.

Wheat

THE SEASON

Excellent seasonal conditions developed in February, 1959, and widespread rains in March and April provided almost ideal conditions for early sowings. By early May, surface soils had dried out in many districts. May rainfall was well below average, but falls in mid-May allowed sowings to continue under good conditions. Rainfall in June was also below average, but it improved in July. August was very dry, and September falls were below average; but rain in October and November improved the prospects and ensured better than average yields.

ACREAGE AND PRODUCTION

Receipts of wheat from the 1959-60 harvest by the Australian Wheat Board totalled 67,000,000 bushels, compared with 60,000,000 bushels the previous year. Allowing for grain held back by farmers to satisfy their 1960 sowing and stock feed requirements, the Commonwealth Statistician estimated the harvest at 75,358,155 bushels from 3,750,389 acres harvested—a yield average of 19.1 bushels per acre.

A record quantity, at least 7,000,000 bushels, commanded a premium.

For the first time premium wheat from N.S.W. was made available for export this year. Cargoes to Japan and Austria sold at a satisfactory premium.

FAIR AVERAGE QUALITY (F.A.Q.)

For 1959-60, two F.A.Q. standards were again declared: one for northern wheat, at 64 lb. per bushel Schopper weight, and one for southern and western wheat, at 64½ lb.

VARIETY POPULARITIES

Gabo continued as the most popular variety grown in N.S.W. and Australia. On acreage, the leading varieties in N.S.W. are (latest statistics, 1958-59): Gabo (20.1 per cent. of the acreage); Glenwari (16.1 per cent.); Bencubbin (15.3 per cent.); Kendee (6.1 per cent.); and Festival (5.2 per cent.). The advance of the poor-quality variety Glenwari to second place is viewed with concern.

WINTER WHEAT

Expansion of the area sown to winter wheats occurred in 1959, with provisional recommendation of the variety Winglen, and the naming of Windebri (a sister line to Winglen).

Both Winglen and Windebri are of appreciably better baking quality than the only other commercially grown winter variety, Winter Minflor. Trials of these varieties were conducted throughout the State in 1959, to test their value—for grazing and for grain—under a wide range of climatic conditions, and to assess their relative baking quality.

DURUM WHEAT

In 1959, a greater area was sown to durum wheat in northern N.S.W. The variety Dural, produced by wheat breeders of this Department, was included in the recommendations for two northern zones.

All Dural grain from the 1959 harvest, other than what was held back for sowing in 1960, was purchased by millers at a substantial premium.

BISCUIT WHEATS

The suitability of certain named wheat varieties for biscuit manufacturing was again subject of a co-operative project between this Department and a leading biscuit manufacturer. In 1959, trials were arranged with co-operating farmers in seven central and southern districts to test nine wheat varieties, for both yield and biscuit manufacture.

Results of the quality tests indicated that by far the most suitable all-round soft wheats of those tested for biscuit making were grown under irrigation at Griffith; in particular, the varieties Pinnacle and Bencubbin at low protein levels. Bencubbin and Pinnacle from the Bathurst district were also acceptable as soft wheats. Varieties tested from a number of centres had too high a protein content to be acceptable as soft biscuit wheats.

WHEAT IMPROVEMENT PROGRAMME

In the South of the State.—Heron, the recently named bunt-resistant variety, developed by the Department's Agricultural Research Institute at Wagga, was further seed-increased during 1959. Also, it was included in recommendations for trial plantings in some southern districts as a possible replacement for Insignia and Koala.

The promising crossbred, M972 (Gular x Dundee) x (Gular x Bencubbin), bred at Temora Experiment Farm, was widely tested in trials throughout the southern half of the State. Its yield and baking quality performances have caused it to be supplied to registered seed growers for extensive seed-increase in 1960.

In the North of the State.—The co-operative work of this Department and the University of Sydney passed an important milestone in 1959 with the final pre-release testing and preliminary seed-increase of two particularly promising back-cross lines of Gabo. They possess resistance to the prevalent races of both stem- and leaf-rust.

Replicated yield trials were sown at Tamworth Agricultural Experiment Station; at the Waterhouse Plant Breeding Station, Curlewis; and on the properties of co-operating farmers at Tamworth, Winton, Gunnedah, Spring Ridge and Narrabri. Stem-rust developed to a marked extent only in the Spring Ridge plots. Valuable observations were made at each centre, as to the suitability of the material for further trials.

Early generation material was sown at Hawkesbury Agricultural College and Castle Hill. Valuable selections were made at each place.

Flag smut infections at Tamworth and Richmond were very effective in eliminating susceptible material.

An innovation in procedure for testing promising new lines was made this year as an adjunct to replicated field trials. It comprised non-replicated trials with selected registered seed wheatgrowers throughout the north-west. In these, two promising new strains were compared with Gabo over a wide range of soil and climatic conditions. The consistency of the newer lines when compared with Gabo was apparent.

Two Gabo Backcrosses Named.—As a result of the aforementioned tests and earlier yield and quality tests it was decided to name two Gabo backcrosses. They are "Mengavi" and "Gamenya".

They resemble Gabo in most respects in the field, and generally in baking quality, but they differ from Gabo in their resistance to both stem- and leaf-rust.

Mengavi derives its stem-rust resistance from *Triticum timopheevi*. Gamenya derives its stem-rust resistance from Kenya 117A. Leaf-rust resistance in both varieties is derived from Mentana.

WHEAT QUALITY ACTIVITIES

Reports by Commonwealth Committees.—The Commonwealth Production Committee on Wheat Quality (this Department represented by the Cereal Specialist), and the Marketing Committee on Wheat Quality completed their reports. A Commonwealth Wheat Quality Conference held in Melbourne in May, 1960, agreed that the reports with some minor amendments and a co-ordinating summary and recommendations be submitted to the Australian Agricultural Council.

Wheat Quality Testing.—Valuable information on the baking quality of new material under field tests was obtained with the co-operation of the Chemistry Branch. Wheat samples from farmers' experiments throughout the State and from variety trials conducted at Wheatbelt Experiment Farms were tested for milling and baking quality.

An important advance for wheat quality testing was made in respect of uniform quality testing of a number of promising advanced lines and named varieties approaching the recommendation stage. This advance provides that samples be distributed under code to five separate testing laboratories. They will independently assess milling and baking quality.

Festival's Success in Competition.—Entries in the wheat classes at the 1960 Sydney Royal Show were the highest since 1957. The rust-resistant variety Festival, bred by this Department, again secured best points for bench characters. It also had the highest bushel weight (70½ lb.) of all wheats entered. There were considerably more entries of Festival than of any other variety.

WHEAT EXPERIMENTS—VARIETY TRIALS

Wheat variety trials on farmers' properties and on Experiment Farms provided valuable information on the field performance and grain yields of promising crossbreds and named varieties.

Wheat variety trials were conducted with 63 farmers in 22 agronomists' districts; testing a total of 33 varieties. Wheat variety trials were conducted also at a number of Experiment Farms testing a large number of promising crossbreds.

Olympic repeated its good performance of previous years and promises to become a widely grown variety in central and southern areas. Its yield was comparable to Glenwari except where stem rust affected yields.

Moora yielded very well in northern and central areas when rust was of significance. In more southern areas where rust was insignificant, Moora was usually outyielded by Olympic and Glenwari. Carl. P4 Bga. WW412 was disappointing in yield and was rejected.

Gl. Dde. x Gl. Brenc. M972 was sown in a small number of trials and yielded quite creditably. Where stem rust was of importance, it was inferior to Moora and Glenwari. In the absence of stem rust it appears to be superior to Moora and it may be comparable with Glenwari and Olympic.

Additional to routine variety testing of spring wheats (in 1959) a series of trials was commenced throughout the State to compare the performances of a number of winter wheat varieties for both grazing and grain, and for baking quality.

Winglen yielded poorly throughout the State, particularly when sown late. Its maturity predisposed it to a stem rust injury and haying-off.

Windebri was tested in a number of grazing and grain trials, to compare its yield with Winglen and Winter Minflor. In almost every trial, Winglen was slightly superior for grazing; but Windebri was superior for grain yield.

SOIL FERTILITY AND ROTATION EXPERIMENTS

Condobolin Soil Fertility and Rotation Programme.—This completed its fourth year. In spite of the frequent dry spells, grain yields were quite satisfactory. Overall yields were: wheat 23.1 bushels per acre, and oats 42.4 bushels per acre.

Superiority of long and medium fallow, over short fallow, was strikingly demonstrated. The long fallow plots averaged 23.4 bushels per acre for wheat (protein content 11.6 per cent.); medium fallow, 24.8 bushels per acre for wheat (protein content 10.6 per cent.), and 46.8 bushels per acre for oats; short fallow, 18.9 bushels per acre for wheat (protein content 8.0 per cent.), and 38.0 bushels per acre for oats. Lucerne gave the best results for grazing; followed by oats; Wimmera ryegrass and barrel medic; and natural pasture; in that order.

Reversion Methods, from Lucerne Pasture to Cultivation.—An experiment at Condobolin Experiment Farm on methods of reverting from lucerne pasture to a cultivation phase was subject of an article in the *Agricultural Gazette of N.S.W.* during the year.

Time of Ploughing; re Wheat Yield and Burr Medic.—A trial to test effects of time of ploughing on wheat yield and the regeneration of burr medic was concluded at Trangie Agricultural Experiment Station. The results have been submitted for publication.

Volunteer Pasture v. Sown Pasture.—The trial to compare volunteer and sown pasture, and their influence on subsequent wheat yields, was continued at Trangie Agricultural Experiment Station. The plots sown to improved pastures have provided nine times as much grazing as the natural pasture plots.

Stubble Treatment.—A stubble treatment trial has been conducted for two years. Yields from the "burn, plus discing" plots have been superior to all other treatments. Significant increases in yield were obtained when nitrogen was applied to the "burn, plus discing" and the "disc in stubble" treatments.

Uniform Wheat Fertilizer Trials.—A series of uniform wheat fertilizer trials ("W.U.F.T.") was commenced, at 19 centres to gather information on the current nutrient requirements of wheatbelt soils.

Northern Trials.—In these, the superphosphate applications were at low rates: 0, 42, 84, 126 lb./acre. Positive response to superphosphate was obtained in four trials out of six. These four trials were respectively at Bithramere (2), Baan Baa, and Trangie Agricultural Experiment Station. No response was evident at Winton and Biniguy.

Southern Trials.—In these, the superphosphate applications were at the rates of 0, 84, 168, 252 lb./acre. A positive response to superphosphate was obtained in five trials out of nine. These five trials were respectively at Cowra, Parkes, Bathurst, Mulwala and Mendooran. No response was evident at Cumnock, Hillston, Condobolin Experiment Farm and Yanco Experiment Farm.

Urea was applied at rates of 0, 20, 40, 60 lb./acre. No response was apparent.

Potash was applied at 0 and 125 lb./acre. A positive response was obtained at Cumnock, but at no other centre.

FIELD WHEAT COMPETITIONS

R.A.S. Competition.—Six Divisional Championships were conducted by the Royal Agricultural Society of N.S.W. Field judging of the winning crops in local competitions was done by officers of this Division of Plant Industry.

Some 767 crops were entered, in 66 local competitions; compared to 893 crops the previous year. Best yielding Divisional Championship crops were: Bordan, 52 bushels/acre estimated yield (Central Slopes); Gabo, 47 bushels (Northern Slopes); Glenwari, 47 bushels (Riverina); Gabo, 45 bushels (Northern); Bordan, 40 bushels (Southern Slopes); and Glenwari, 40 bushels (Western).

Junior Farmer Clubs Wheat and Oat State Championships.—These championships were judged by one district agronomist. Twenty entries were received for the wheat, and four for the oat championships. Best wheat entry was a crop of Festival. It yielded 43 bushels per acre. Of interest, all oat entries were the Fulmark variety bred by this Department.

Oats

Production and Acreage.—Production from the 1959-60 crop has been forecast as in the vicinity of 12,000,000 bushels of grain from 680,000 acres; and 120,000 tons of hay from 103,000 acres. The 1959 sowing of oats for all purposes was about 1,100,000 acres; compared to the record area of 1,627,000 acres in 1958.

Variety Popularities.—There has been a significant change in the relative popularities of oat varieties since the previous season. Belar fell from 54.8 per cent. to 45.6 per cent. of the acreage; Algerian from 26.8 per cent. to 22.4 per cent. Varieties finding increased favour with farmers are Acacia, 2.4 per cent. of the average; Ballidu, 3.1 per cent; Burke, 3.0 per cent.; Dale, 4.9 per cent; and Orient, 2.3 per cent.

Oat Experiments—Variety Trials.—In addition to their location on Experiment Farms, oat variety trials were conducted in 1959 (1958 figures in brackets) with 31 (36) farmers in 20 (23) agronomists' districts; testing 23 (20) varieties. Of trials in 1959 on farmers' properties, 80 per cent. were randomised and replicated (68 per cent. in 1958).

Variety Performances.—Stem rust affected the yields in some oat trials but less so than in the wheat trials. Avon and Burke yielded well. Alpha yielded poorly, was very prone to shattering, and will be dropped from the trials.

Avon yielded very well throughout the State. It was superior to the standard, mid-season varieties Belar and Dale, and about equal to Burke and Fulmark. Avon's strong straw and resistance to shattering were confirmed in many trials subject to strong winds and rain.

Kent was about equal in yield to Ballidu, but inferior to Orient. Once again it showed high susceptibility to stem rust.

Coker's Fulgrain, Osage, Victorgrain 4, and Fulgrain 6, all introduced from U.S.A., were tested in some of the trials. Coker's Fulgrain and Victorgrain 4 about equalled each other in yield, and both were superior to Osage and Fulgrain 6. Of them, only Victorgrain 4 will be continued in the trials.

Oat Improvement Programme.—A dual purpose, grazing and grain oat is the main objective of the improvement work.

All the crossbreeding and single plant selection projects for the north west and coast were performed at the headquarters of this programme, the New England Experiment Farm, Glen Innes.



The Centre Plot of Wheat?—No Superphosphate!

In the "Wheat, Uniform Fertiliser Trials" (W.U.F.T.) in southern New South Wales, testing the status of current recommendations, the phenomenal response to superphosphate has been confirmed.

The yield testing of early maturing and of mid-season selections was respectively at Curlewis and Tamworth Stations. Selections from the cross Fulghum x Garry were outstanding in grazing productivity. They yielded 1½ tons of dry matter, over two grazings, followed by 40 bushels of grain/acre.

The Fulghum x Garry selection, W4597, topped the grazing yields at Glen Innes, and also topped the grain yields at Curlewis. The V.R.A.F. selection, W4514, which topped the grain yield at Glen Innes in 1958, also outyielded all others in Moree in 1959.

Progress of Rust-resistance Projects.—On oat crown rust nursery sowing was planned for 1960; and the seed was forwarded to Grafton Experiment Farm, to supplement disease observations made at headquarters (Glen Innes) and to appraise agronomic values on the coastal plain.

Prior to the release of Acacia (genotype ABCd), Richland stem-rust resistance (gene A) became ineffective in N.S.W. Introduction of Garry, from Canada in 1947, and successful hybridisation of this variety with Fulghum, the most desirable grazing and grain-storage parent for the northern region, marks the beginning of the present success in oat breeding. The ABCd genotype remained as fully effective during the past season, even at Curlewis.

Sowing in early spring for production of oaten hay or grain is practised throughout the tablelands. For this purpose, rust resistances are absolutely essential, because the later the sowing the greater is the risk of all the grains of a susceptible variety failing to develop any embryos. During 1959-60, the best quality grain selections from the Clintafe (abcd) x V.R. Bke. F. Ga. (ABCd) cross made in 1958 were selected. This was with a view to combining Bond and Santa Fe leaf rust resistance, short strong straw and freedom from secondary growth of Bond, and the earliness, Victoria resistance and vigour of the Garry crossbred.

New Release of Smut-resistant Selections.—The following smut-resistant oat selections are being seed-increased for possible naming and release, though rust-resistant lines are not yet available:—

W4477: A mid-season line, with grain type comparable to that of Belar; from a V.R. Bke. F. W. F. cross.

W4401: A late maturing oat with tolerance to crown rust, to replace Klein if possible; from the cross V.R.A. x Vrome. Mediocre grain quality.

W4304: A mid-season to late maturing oat, to replace the old Algerian strain; from the cross V.R.A. Good quality grain.

Rate of Seed and Fertiliser.—These experiments, with grazing oats, have proceeded for two years.

In the 1959, there was a significant response to an increase in seeding rate from 40 lb. to 80 lb./acre and the application of 1 cwt./acre of sulphate of ammonia. Increase of seed to 120 lb./acre and to 2 cwt./acre of sulphate of ammonia, gave only an insignificant increase in yield.

Superphosphate at 1 cwt./acre gave a good increase in yield, over no superphosphate; but at 2 cwt./acre superphosphate gave no further response.

Barley

Interest in barley was maintained. It is possible that the sown area reached or exceeded the previous record acreage, viz 106,000 acres for grain in 1958-59. However, grain production is unlikely to have approached the 1958-59 record yield of 2,922,000 bushels.

During the year, a number of unfixed barley lines from Grafton Experiment Farm were handed over to the Waite Research Institute, South Australia, for further testing.

Barley variety trials, comparing standard varieties, were recommenced on farmers' properties at four centres.

Cereal Rye

Local manufacturers continued their interest in this crop. In the absence of supply within this State, their main requirements of rye grain have to be imported from other States. Farmers, however, continued to be wary of increasing their cereal rye acreages, because of uncertain prices.

Seed stocks were maintained by the Department; Weethalle strains at Trangie Experiment Station; Strain 8 at Cowra Experiment Farm; and Black Winter at New England Experiment Farm.

Seed of N.I.A.B. was obtained from Tasmania during the year. It has been included in grazing trials at Experiment Farms this season.

Cereal Pure Seed Production

Supplies of pure seed of recommended and promising varieties of wheat, oats, and barley were maintained and distributed through Registered Seed growers.

Revised Scheme.—A revised Registered Seed Production Scheme commenced operation with the 1959 sowing season. The revision is aimed at ensuring that Registered Seed growers abide by certain conditions in return for the Foundation Seed supplied by the Department.

Foundation Seed from Experiment Farms.—Less acreage was used in 1959 for production of Foundation Seed on Experiment Farms. Foundation sowings on nine Experiment Farms and Stations totalled (with 1958 figures in brackets) 213 acres of wheat (320), 200 acres of oats (195), and 18 acres of barley (17). The total was 106 acres less than in 1958.

Foundation sowings of recommended and promising varieties in 1959 comprised (1960 figures in brackets) 30 wheat varieties (18), 23 oat varieties (7), and 5 barley varieties (2).

Initial Selection and Preliminary Increase.—Associated with the pure seed production scheme on Experiment Farms and Stations, initial selection and preliminary increase of wheat and oats were done at Temora; of barley at Wagga; and of some oat varieties, suitable for northern conditions, at New England Experiment Farm.

Registered Seed Farmers.—In 1959 (1960 figures in brackets), 114 Registered Seed wheat growers (116), under supervision by 22 district agronomists (21), and using Foundation Seed supplied by the Department, undertook seed increase of 20 wheat varieties (20); 90 Registered Seed oat growers (88), under supervision by 19 district agronomists (20), carried out seed increase of 14 oat varieties (14); and 9 Registered Seed barley growers (6), in 8 district agronomists' areas (6), undertook pure seed production of 4 varieties (5).

Maize

The season did not favour maize growers. Excessive wet conditions early in the season interfered with sowing plans and reduced the acreage sown.

The State's maize yield was lower than normal. Increasing use of maize by the maize producers was again noticeable. This and the reduction in acreage created a bigger than normal demand for grain. Thus, above average prices were realised.

Hybrids developed previously and released to commercial maize growers have good results. The acreage of G.H. 128, bred at the Grafton Experiment Farm, increased throughout coastal areas; and also gave good results in Queensland, where special disease problems are encountered.

Maize Improvement Programme.—Work continued at the New England and Grafton Experiment Farms; aimed at breeding higher yielding and better disease-resistant hybrids. Adverse seasonal conditions hindered the work, but progress with some projects was satisfactory.

The Queensland Department of Agriculture and Stock again co-operated, by testing inbreds and hybrids for Grafton Experiment Farm. Results emphasised that the maize-breeding programme at Grafton Experiment Farm has great value for maize growers in the higher rainfall areas of Queensland.

The male sterility programme progressed satisfactorily. Two additional inbreds were converted to the male-sterile form.

Need for greater resistance to leaf blight (*Helminthosporium turcicum*) in maize hybrids was emphasised by losses the disease caused. Late maturing hybrids released from the Grafton Experiment Farm proved highly resistant to the blight, but all early maturing hybrids proved highly susceptible.

Blight resistance studies on inbreds were commenced, and the ability of resistant inbreds was also studied. No outstanding source of resistance was detected in the new inbreds, but certain introduced inbreds, reported to be resistant in the United States of America, were found to be more susceptible to the disease under the conditions experienced.



Inoculating a Promising Potato Cross-bred Line; Testing for Resistance to the "Late Blight" Fungus.
In the project seeking potato varieties immune to race 0 of *Phytophthora infestans*, this year's results showed 33 agronomically promising seedlings resistant.

A waxy maize hybrid, the first developed in Australia, was produced at New England Experiment Farm. Seed was made available to manufacturers. They have shown interest in the special starch properties characteristic of the waxy hybrid.

Seed Certification.—The year was satisfactory for hybrid maize seed-producers, although over-production during the previous two seasons led to less acreage being sown under the Hybrid Maize Seed Certification Scheme. Sixteen thousand bushels of certified seed were produced by fifty-three growers, from 412 acres, compared to 22,000 bushels, produced by sixty-five growers, from 587 acres in the previous season.

Hybrid Maize Seed Growers' Co-operative.—The Co-operative initiated a marketing pool for disposal of late maturing hybrids. Some prominent growers, opposed to pool marketing, ended their association with the Co-operative and individually commenced hybrid maize seed production. This caused administration difficulties, and amendments to the Seed Certification Scheme rules.

Yield Trials.—Forty-seven trials for grain were conducted, to ascertain the relative values of hybrids in various maize growing areas. Departmental hybrids and those developed by a private company were tested.

Commercial hybrids again proved their superiority. The season, however, emphasised the important need to develop disease resistance in hybrids for coastal districts.

Fertilizer Trials.—Fifteen trials of the effect of fertilizer (and spacing of maize) were studied. They indicated that nitrogen played an important part in maize production, and that nitrogen utilisation was governed largely by soil and seasonal conditions.

Molybdenum Deficiency.—Molybdenum deficiency in maize seed was shown to occur, and to be the cause of crop failures when this seed is planted on molybdenum deficient soil without some corrective measures. It has also been proved that there is a varietal difference in molybdenum needs, and that heavy applications are required to correct the deficiency.

Introductions.—Introduction and sowing of maize material under quarantine conditions at Leeton Experiment Farm was a feature of the year's work. Good results were obtained.

Insect Pest Control.—Trials were initiated on the north coast, testing efficiency of various insecticides for prevention of weevil damage to ripening maize crops.

Sweet Corn

Improvement Programme.—The sweet corn improvement programme contained at Yanco Experiment Farm. New hybrids were made and tested. Canning firms co-operated to assess the value of existing and new hybrids. They continue to favour the use of the hybrids Iochief and Golden Cross Bantam.

Commercial firms generally experienced a difficult year for sweet corn production.

Seed Certification Scheme.—Inbred material for production of sweet corn seed was again supplied from the Yanco Experiment Farm to growers and commercial firms.

Twenty-five acres were certified for seed; compared to sixty acres the previous season.

Popcorn

A few commercial firms, and growers, maintained interest in popcorn production. Enquiries were received from an American source concerning the possibilities of popcorn succeeding here; while an established firm sought assistance towards import of processing machinery.

Improvement Programme.—Work with popcorn continued at New England Experiment Farm. Popcorn hybrids proved far superior to open pollinated varieties in yield and in expansion ration.

Certified Seed.—Nine acres of popcorn seed were certified on behalf of a private company; and inbred material of a superior popcorn hybrid developed at New England Experiment Farm was made available to a commercial seed grower, and certified in the first year.

Sweet Sorghum

The sweet sorghum crop again played a valuable part in the feed programme on many coastal farms. Interest in use of this crop for ensilage purposes has increased.

White African, Saccaline, and Early Orange proved their superiority to other varieties introduced and tested by the Department.

Seed Certification Scheme.—It was a difficult year for producers of sweet sorghum seed under the Seed Certification Scheme. There was a big carryover of seed from the previous season's activities, and low prices resulted.

Adverse seasonal conditions caused a considerable reduction in the areas registered under the Scheme. Only ten growers participated. They produced an estimated 1,500 bushels, compared to twenty growers, producing 6,000 bushels, in the previous year.

Sudan Grass

A considerable reduction of interest in Sudan grass occurred, following the availability of seed of *Sorghum alnum*. Some 75 per cent. of the area normally sown to Sudan grass was sown to the perennial, *Sorghum alnum*.

Work on improvement of sweet Sudan grass strain S.S.6 continued at Cowra Experiment Farm.

Sorghum alnum

Seed Sales Ban Removed.—The former ban on the sale of *Sorghum alnum* seed was removed in New South Wales, because of the plant's potential as a fodder crop in certain areas.

Seed Purity.—It was not possible to differentiate between seed of *Sorghum alnum* and Johnson grass, a noxious weed throughout the State, and difficulties arose. Seed merchants have the responsibility of obtaining seed only from those areas known to be free of Johnson grass, and growers have been warned of their own responsibility to ensure that seed purchased by them is from areas where the purity is known.

Big Acreage.—In New South Wales, *Sorghum alnum* became a major crop as soon as seed was available. It has been estimated that in the first year approximately 400,000 acres were sown. The biggest development has been in the north-western and central regions of the State.

Trials.—Trials were conducted at Experiment Farms and Stations and in various districts. The results indicate that, under good soil and seasonal conditions, *Sorghum alnum* has a big future as a perennial, summer-growing grazing crop in many parts of the State.

The trials and observations have enabled the Department to recommend its use under certain conditions on the north-western slopes and plains.

Ensilage.—Ensilaged in the previous year, *Sorghum alnum* was utilised on some properties in the north-west during the dry summer. Cattle ate the silage readily; but sheep required time to become accustomed.

Seed Certification.—A Seed Certification Scheme was initiated by the Department, to operate in the Shires of Boomi, Boolooroo, Namoi and Yallaro.

An area which had been under observation by the Department for nine years, and sown with the original strain of seed introduced into New South Wales, was selected as a source of Foundation seed for the Scheme. Some ninety bags of Foundation seed were certified.

Adverse seasonal conditions hampered progress of the Certification Scheme in its initial year; but the groundwork has been done for production of Certified *Sorghum alnum* seed in 1961.

***Sorghum alnum* Improvement Programme.**—This continued at Grafton Experiment Farm. Plant selections were made, and their testing is proceeding.

An attempt was made to test the natural cross pollination of *Sorghum alnum* and *Sorghum halepense* (Johnson grass). This work is continuing.

A grazing trial was continued at Glenfield Veterinary Research Station to obtain information on prussic acid poison danger from *Sorghum alnum*. Results at the end of the season were inconclusive.

Grain Sorghum

There were ten district trials of grain sorghum varieties, but results were poor, due to adverse seasonal conditions.

Grain sorghum crops throughout the north-west also failed. However, the grain shortage threat was alleviated by expansion of the area sown to this crop throughout southern irrigation districts. High yields were obtained from grain sorghum under irrigation. The crop has established itself as important in irrigation farming.

Hybrids.—Hybrids introduced by a private firm were tested in four centres but seasonal conditions handicapped the observations.

Material introduced by the Department for production of a hybrid grain sorghum was maintained on Experiment Farms. Liaison was also established with similar work by the Department of Agriculture and Stock in Queensland.

A private company also commenced breeding work with hybrid sorghum.



Sorghum alnum in the North-West

It has a big future as a perennial, summer-growing grazing crop in many parts of the State. Cattle have also taken readily to it as silage. In the first year since the ban on sale of *Sorghum alnum* seed was lifted, some 400,000 acres have been sown. A seed certification scheme has been initiated by the Department.

Pure Seed Production.—Grain sorghum varieties recommended to commercial growers by this Department performed very satisfactorily in southern irrigation districts. Yields of up to 70 bushels/acre were obtained. Some 6,000 acres were sown there.

Production of pure seed of the commercial varieties was maintained at the Experiment Farms, and small quantities were available to farmers. Of the new varieties introduced for testing those showing promise were seed-increased.

Waxy Sorghum.—A sorghum variety with waxy starch properties was given a thorough trial. A commercial firm successfully extracted the waxy starch from the sorghum, and this was used in canning certain products.

Arrangements were also made to expand the acreage of the waxy sorghum variety, in anticipation of greater demand for waxy starch.

Broom Millet

Broom millet producers had a successful season. The overall acreage was less, and yields in some instances were light, but high prices were obtained for the fibre.

Improvement Programme.—Improvement of this crop, by selection, continued at Bathurst Experiment Farm. A district trial was conducted, to compare selected strains with those in commercial use.

The year's observations indicated that no improvement over the broom millet variety being used commercially has yet been made by the selection programme.

Fodder Millets

Introductions.—Promising introduced fodder millets were compared with those in commercial use. Some of the introductions showed promise. They will be seed-increased.

Soybeans

Prospects.—Because of the shortage of protein meals, interest in soybeans increased during the year. Farmers, some manufacturers, and persons connected with the poultry industry, inquired as to the future of the soybean industry in this State.

Investigations indicated a limited market for soybeans in New South Wales. Production on a large scale could not be recommended, in part because of the low yields from existing varieties.

Introductions.—Introduced varieties were tested at New England, Tamworth and Leeton Experiment Farms. At Leeton, under irrigation, the yields from small plots were quite promising.

Contact was made with the C.S.I.R.O. towards co-operative testing, in N.S.W., of soybean introductions and hybrid material showing promise in Queensland.

Cowpeas

The acreage sown to cowpeas increased; so, too, did the area sown for seed production. Much of the seed used was produced in north-western N.S.W.

Poona was still the popular variety, but disease-resisting varieties Malabar, Blackeye 5, and Havana were tried. They gave promise.

Miscellaneous Legumes

Sweet Lupins.—The availability of a sweet lupin variety led to an increased acreage. A Mulgoa farmer successfully produced lupin seed commercially, for the first time in N.S.W.

Vetches.—There was an increased acreage, mostly in coastal area. Attempts to produce vetch seed in N.S.W. were unsuccessful, and the price of imported seed was twice what it was in the previous year.

Velvet Beans.—These were used on some coastal farms. Attempts to produce seed in inland areas were unsuccessful in this adverse season.

Others.—Work with other miscellaneous legumes increased. Seed production problems exist, but investigations have shown that seed production of some lines, in N.S.W., is practicable.

The Russian Comfrey work continued at Grafton Experiment Farm and observations were made in other districts. Trials and observations indicate that this plant has only limited application. Although it may be a valuable source of protein, it has been unpalatable as a grazing crop and has not yielded as heavily as was claimed for it.

Tobacco

Success of Breeding for Blue-Mould Resistance.—The main aim of the Department's tobacco breeding work has been to provide producers with a strain or strains highly resistant to blue mould and possessing field characteristics comparable to those of Hicks. A major success is in view.

Australia-wide Field Trials.—Field trials of the N.S.W. products were Commonwealth-wide last summer. Seed of two promising lines, A.1 and A.2, and of several other hybrids, were supplied to the Queensland, Victorian and Western Australian Departments; also to the C.S.I.R.O., for trials on the Mareeba Tobacco Research Station and for glasshouse tests in Canberra. Similar seed lots were supplied to W. D. & H. O. Wills for trials on that company's Tobacco Farm at Tinana Creek, Queensland.

In addition, the two hybrids A.1 and A.2 were planted under commercial conditions by five N.S.W. farmers in 1/6th acre experiment plots. This Departmental grower co-operation was extended to include replicated trials by two of these farmers. The growers tested twelve crossbreds (also supplied to other States), and made row-plantings of thirty-three other promising lines.

Reports from the C.S.I.R.O., from W. D. & H. O. Wills, and from other States all indicated that the strain A.2 is comparable to "Hicks" in field characteristics and, as well, has extremely high field resistance to blue mould.

Useful details were also obtained concerning field performances and characteristics of the crossbred material included in farmer and interstate replicated experiments.

The leaf from the five growers/Departmental trials was consigned to leading tobacco manufacturers in Australia, all having agreed to conduct analytical and manufacturing tests. Two companies agreed, also, to subject the leaf to maturation, manufacturing and smoking tests, in that order, on a near-commercial scale.

Progress Summary.—From the trials to date it would appear that immediate release of the A.2 strain would be justified, because of its blue mould resistance, good yield, and apparently satisfactory leaf quality. However, on the advice of tobacco manufacturers (and growers agree), the blue mould resistant lines will not be released until the smoking quality has been proved.

Safeguard.—The tobacco breeding work at Bathurst and New England Experiment Farms during the past ten years has yielded the Department many lines from which mould resistant hybrids, of good smoking quality, could be selected if the A.2 strain were to be rejected—as is most unlikely.

Fundamental Research on Blue-Mould Resistance Mechanism.—Research of a fundamental nature is also being conducted into the mechanism responsible for plant resistance to blue mould. This is producing quite original findings.

Other Tobacco Research Aims.—Other aims of the tobacco programme at New England Experiment Farm are to discover the bio-type status of the blue mould fungus (*Peronospora tabacina* Adam.), and to determine the occurrence, intensity, influence, species and strain status of the very destructive nematode present in most tobacco soils.

Additional Facilities.—The tobacco plant pathologist stationed at New England Experimental Farm has been provided with a large glasshouse; a unit additional to that already used by the tobacco plant breeder.

Funds were provided by the Central Tobacco Advisory Committee from the Tobacco Industry Trust Account to establish a Tobacco Research Station in the tobacco growing areas near the township of Ashford. Preliminary arrangements have been made for this establishment.

Five acres of land, situated 18 miles from New England Experiment Farm, have been leased for use as a Tobacco Sub-Station; for testing early generation crossbreds.

Rice

Rice Production Record.—Some 49,988 acres were sown to rice. Production was a record—125,000 tons; 1,000 tons more than the previous season's record. Yield average per acre was also a record: 2.55 tons as against 2.5 in 1954-55.

In response to requests from Rice Growers' Organisations, steps were initiated under the New South Wales Plant Diseases Act to prevent rice and all rice products, including polished rice, from being introduced into the rice growing districts of N.S.W. This will give emphasis to the need to produce a long-grained rice possessing desired field characteristics and good cooking quality; an objective of the rice breeders for years past.

Selection from Blue Bonnet 50.—A selection from a semi-long grain variety, Blue Bonnet 50, has proved promising. It is to be seed-increased for release to commercial growers.

Pests.—Blood worms and weeds are major problems.

Blood worms thrive in soils containing a high percentage of organic matter. Since rice crops are sown on long-term pasture soils, blood worm numbers can reach alarming proportions. Entomologists and agronomists continue to devote attention to the problem of obtaining better methods of control.

Satisfactory measures for eradication of Barnyard grass or to reduce its effects on rice yields have yet to be achieved. Results obtained by pre-emergence soil treatments with the herbicide TCA have been encouraging, but further experiments are needed before the treatment may be recommended.

Linseed

There was more interest in linseed. Some 1,600 acres were sown; a fourfold increase on 1958. Many growers would cultivate this crop, but only if demand and price were assured.

Paint manufacturers are the most important users of the product. Because of the prices fixed for drying and semi-drying oils, paint manufacturers are now weighing establishment of an industry for expression and/or solvent extraction of vegetable oils. That industry would have the greatest influence on production of vegetable oils in Australia. It would lead to immediate expansion of acreage sown to linseed.

Little progress was made with a linseed improvement programme because staff could not be allocated to it.

Cotton

Irrigation farmers have shown keen interest in cotton, as an alternative crop.

At a very successful field day in the Murray Valley, some 600 people attended to see and discuss economic possibilities of a cotton crop.

Field Experiments, Narrabri.—Field experiments were again conducted at Narrabri Experiment Farm. They include: a Variety trial; a Time of Sowing trial; a Method of Irrigation trial; a Method and Time of Irrigation trial; and, in addition, exploratory work to determine methods for control of insect pests and weeds in cotton.

In the variety trial, Empire showed promise. Indications are that it will yield in excess of 2,000 lb. of seed cotton to the acre.

The time of sowing trial showed that, in normal years, the first week in October would be the most suitable time to sow.

The method and time of irrigation trial was deferred because of irrigation machinery troubles.

Preliminary trials to control insects and weeds yielded useful information, and will be continued.

Improvement Programme, Narrabri.—A cotton improvement project at Narrabri Experiment Farm includes a world-wide collection of species. Among them are all species of Australian wild cotton, and the varieties introduced during 1958 and 1959.

Difficulty was experienced in obtaining flower and seed-set in some of the varieties and species derived from tropical latitudes. This problem was solved by subjecting them to reduced day-length conditions, to simulate the light conditions of their natural environment. With few exceptions, they then flowered and set seed.

Several crosses were made, aimed at producing suitable varieties for N.S.W. Production of seed was also given attention.

The percentage of natural crossing in cotton is not high; but proper founding of this breeding work depends on production of pure lines of all varieties under test. Therefore, flowers were bagged and selfed; and the number thus treated totalled thousands.

Ramie

Some research on ramie has been maintained in the hope that the Australian process for fibre extraction, wherein this Department has given development assistance, may be taken up and financed by commercial interests. That is necessary before crop production could be encouraged.

The situation is still uncertain; meantime, work on the agronomy and field techniques of ramie production will continue.

Irrigation Section

Trends.—The rainfall conditions in 1959-60 caused a slight increase in irrigation practice, generally, as compared with the previous year. This was more so in respect of spray irrigation, but there were increases also in the practice of flood irrigation.

Increase in development of private flood irrigation schemes, pumping from rivers, has been appreciable in recent years. This trend continued, but increase or decrease in the annual total area is not so marked as is in the case of spray irrigation. The reason is that flood irrigation is mainly located in the drier inland areas, and there it is only in an exceptionally high rainfall year that some definite advantage would not be achieved by applying irrigation water.

Extension Advice.—There has been a constant demand for advice on irrigation practice. Many of the enquiries have been in person, and others by letter or 'phone. Advice on irrigation matters has also been extended through press notes, radio broadcasts, and talks at field days.

Irrigation Schools.—To ensure that all field officers have up-to-date knowledge of irrigation developments and practice, two further in-service training schools were held. Over the past three years, eight such schools have been held, attended by some 150 field officers.

A second, successful irrigation school for farmers was held at Wee Waa in the north-west, organised in association with the Agricultural Bureau.

Irrigation subject-matter is included also in the Yanco Experiment Farm schools for farmers. Lectures and demonstrations there by Department of Agriculture officers have been helped by contributions from officers of the N.S.W. Water Conservation and Irrigation Commission.

Irrigation Research.—In connection with spray irrigation, a series of field tests under varying wind conditions was made at Yanco Experiment Farm. Determination of uniformity co-efficients for the various tests is done by the University of New South Wales.

These tests have indicated need for improvement in the manufacturing standards of sprays; and that field performance of some spray equipment does not support claims made by the respective manufacturer or distributor. The University of New South Wales investigated performances under still air conditions with similar results.

In-service, post-graduate training, particularly in hydrology and mathematics, has this year been undertaken by the irrigation research agronomist. He attended for three months a special course in water engineering at the University of New South Wales.

Irrigation Designs for Experiment Farms.—Three designs for irrigation by spraying, and two for flood irrigation, were prepared by the special agronomist (irrigation).

Designs and/or proposals for irrigation at Hawkesbury and Wagga Agricultural Colleges; Gosford Citrus Experiment Station (Somersby Section); Yanco Experiment Farm; and the Tropical Fruit Research Station, Alstonville; were under discussion with the Department.

Irrigation and Allied Committees.—This Department continued to be represented by the special agronomist (irrigation) in a number of committees dealing with matters of mutual interest to this Department and the N.S.W. Water Conservation and Irrigation Commission. Brief notes are reported in following paragraphs.

Blowering Dam Investigations Committee.—The Blowering Dam Investigations Committee continued its enquiries, and made recommendations to the Minister for Conservation, regarding all matters of irrigation development and utilisation of the increased water supply in the Murrumbidgee River. The terms of reference are wide. They include, inter alia, recommendations re town sites, finance for farm development, areas to be developed, amenities and services. Four meetings were held.

Water Act—Board of Enquiry.—Three meetings of the Board of Enquiry (Water Act) were held to complete matters referred to it by the Water Conservation and Irrigation Commission.

Development of Irrigation Districts.—This committee continued its investigations with a view to recommendations on water allocation to districts.

Hunter Valley Conservation Trust.—Eleven meetings, and five inspections of works and proposals were conducted by the Trust. There were also meetings of and reports by the soil conservation sub-committee of the Trust. An item of particular importance under the Trust Act was dealt with by the sub-committee and is now before the Trust; the proposal for declaration of an area of about 1,300 acres as an Area of Erosion Danger.

Hunter Valley Flood Mitigation Act.—The Assessment Board under the Hunter Valley Flood Mitigation Act had no cause to meet during the year.

Standards Association of Australia; re Spray Equipment.—The Standards Association's drafting sub-committee held nine meetings; to review literature from world-wide sources, and statements from Australian and overseas authorities, relevant to the test procedure and field performance of spray irrigation equipment. The aim is to promulgate an Australian Standard for Spray Irrigation equipment manufacture and performance.

At the request of the sub-committee, test techniques for still-air conditions were applied at the University of New South Wales, Manly Vale Laboratory; and the progress results of field testing by this Department at Yanco Experiment Farm were also given to the sub-committee.

Farm Water Supplies Act.—The Water Conservation and Irrigation Commission continued to refer to the Department of Agriculture for report, applications for advances for installation of irrigation under the Farm Water Supplies Act, where such advances exceed £1000. Better liaison was effected, in that reports by agronomists are now given to the W.C. & I.C. District Engineers, and the latter's reports and design are reciprocally given to district agronomists.

During the year 67 such applications were dealt with. In addition, many applications, either not involving loans or for a lesser amount than £1,000, were discussed with the designing officers of the W.C. & I.C., and recommendations were made thereon.

DIVISION OF HORTICULTURE

Regulatory Services

PLANT QUARANTINE

Import Inspections

Importations of overseas plants and plant products were examined for the Commonwealth Department of Health in accordance with the Quarantine Act.

Seed.—Grass and clover seed imported amounted to 21,158 sacks, as against 10,057 last year. Most seed came from New Zealand and in the main comprised rye grass, and some clover. A total of 979 sacks was found to contain weed and/or prohibited seed, and required cleaning. Some lines were infested with insects and were fumigated before release to importers.

Importations of flower and vegetable seed, excluding pea seed, were much less than last year. They were mainly from the U.S.A., with much lesser quantities from Holland, New Zealand and the United Kingdom, and were mostly carrot, beetroot and lettuce seed. Some consignments contained weed seeds or were infested with insects, and appropriate treatment was directed before release.

Nursery Stock.—Importations were much the same as last year. Most came from the U.S.A., Hawaii, South America, the United Kingdom and New Zealand; and comprised 6,690

orchids, 4,838 ornamental plants, 1,987 rose budding eyes, 51,200 Lily of the Valley pips and 25,271 bulbs, tubers and rhizomes.

In some consignments insect infestations were found, mainly scale, mites, aphids. Fungus diseases were present in bulbs; all were treated according to the condition and permitted to go to registered quarantine nurseries, along with all other plants after appropriate treatment, to be grown under post-entry examination.

Passengers' Baggage.—138 overseas vessels were met, for inspection of plant material brought in by passengers. Considerable prohibited and infested goods were detained for destruction or treatment.

Parcels Post.—Daily inspections were made at Parcels Post Office of all parcels and packages received from overseas containing or suspected of containing plants or any form of plant material, as well as those containing goods or merchandise likely to be subject to quarantine control.

The total of parcels submitted for examination was 10,825, as against 10,165 for the previous year. Those detained for further examination, treatment, or destruction as the case required, totalled 2,737 as against 2,587. Contents of detained parcels comprised mainly seeds, plants, bulbs, raw cotton samples, popcorn, cereal seed and peanuts.

Timber.—Importations of timber in log form and sawn amounted to some 199½ millions super feet, 27 million more than last year. Most significant increases were from Malaya—5 million; New Zealand—9 million; Borneo and Pacific Islands—9 million logs. Borer infestation was found in logs from West Africa and Malaya, in hickory billets from North America and sawn Klinki pine from New Guinea. All infested timber, after appropriate treatment under supervision, was released to importers.

Sirex Wasp.—Inspection was maintained on all overseas wharves, in examination of cases and wooden crates of general merchandise, for detection of Sirex wasp and other wood-boring insects. Each year the overall quantity quarantined is reducing, indicating greater care in selecting borer-free timber for manufacture of cases.

General.—750 overseas vessels discharged a wide range of plant material subject to quarantine inspection. Some of the principal imports were seeds, copra, peanuts, canning beans, cocoa and coffee beans, nuts, bamboo ware, beverages, bales of raw cotton, timber, etc. A considerable quantity of some of these goods was subject to treatment, under supervision, by fumigation, heat treatment, recleaning, or crushing, as the case required.

Export Inspections

Exports of fresh fruits, seed, flour, rice and oats were inspected under the provisions of the Commerce (Trade Descriptions) Act.

Citrus Fruits.—A total of 4,155 cases of Navel oranges was exported, and 2,781 of these were shipped to New Zealand; the rest went to the Persian Gulf. Rejections at shipside inspection amounted to 554 cases for rind breakdown and *Septoria* spot.

Shipments of Valencia oranges amounted to 30,585 cases, considerably more than last year's total. The bulk of the fruit went to Singapore, 21,326 cases; 5,073 to New Zealand, and the rest to Penang, Port Swettenham, Port Louis and the Persian Gulf.

Apples.—A total of 110,600 cases of apples was exported from Sydney. Of this quantity, some 72,000 were N.S.W. grown; 33,000 were from Queensland, 3,000 from Victoria, and 1,500 from Tasmania. Except for a few hundred cases of Democrats and Jonathans, the apples were Granny Smiths. Practically all was exported to the United Kingdom; only 3,300 cases to Aden and Hong Kong, and 1,500 of Tasmanian fruit, as transshipment, to Honolulu.

The first shipment of Granny Smith apples was on 21st February, 1960, and almost all were from the Murrumbidgee Irrigation Areas. The remainder were from near-coastal districts, and the size was restricted to 180 counts and larger fruit until 1st March, 1960. The fruit was inclined to be immature at this stage, by the accepted standard of this Department. Subsequent fruit was drawn from Forbes, Bathurst, Uralla, Orange and Batlow.

The fruit presented was generally of high standard, and rejections were usually for faults which should have been obvious at packing. Case standard was better than for years, but there was some trouble with loose labels. Out-turn in the United Kingdom has been excellent, and favourable comments have been forthcoming from the fruit officer in London as regards N.S.W. Granny Smith apples.

Pears.—The only shipment of pears was 1,350 cases of Packhams to Singapore.

Grapes.—There was only a very small export of grapes, 800 cases to Singapore from the M.I.A. Berries were inclined to be small, but condition was excellent.

Island Trade (Fresh Fruit).—Frequent small shipments of fresh fruits in season were exported to New Guinea and the Pacific Islands.

Seed.—A total of 7,244 bags of seed was exported to the U.S.A. and New Zealand; paspalum, subterranean clover, millet, canary, prairie grass and Rhodes grass seeds.

Flour.—Some 171,588 short tons of flour were exported from Sydney, 101,781 tons more than last season. The big difference was due to the drought in 1957, whereafter wheat was imported and no flour was exported between June and September, 1958-59. Of the total 1959-60 shipment, 72,200 tons of flour went to Colombo in seven complete shipments. The other main importing countries were Malaya, United Kingdom and Pacific Islands. Only trace proportions of beetle infestation were found in metropolitan and country flour at shipside inspection.

Rice.—Export of rice was about the same level as last year. It went in the main to the United Kingdom, New Guinea, the Pacific Islands and New Zealand. Several consignments were held up due to live insect infestation. These were fumigated with methyl bromide before shipment.

Oats.—Several large shipments of feed oats for Germany were submitted for issue of International Health Certificate, and were found to be heavily infested with beetle and weevils. They were subsequently fumigated before shipment.

CITY MARKETS AND INTERSTATE SUPPLY INSPECTIONS

Apples.—The quality of apples at the end of the 1959 season was rather poor, especially Granny Smiths from the Kentucky district. These broke down rapidly. Other N.S.W. grown applies were of fair condition, except for ice-scald in some consignments of Granny Smiths from Orange. Jonathans from Victoria were badly affected by Jonathan spot and

mostly poorly coloured, the Rome Beautys showed lenticel spot, and the Granny Smiths were badly scalded. Tasmanian fruit was in light supply, and was of good quality and appearance except for some bruising. Red mite infestation was in very light proportions.

New season fruit was in heavy supply, with a big percentage of small fruit. Most of the consignments from Oakdale and from local districts were severely blemished by hail marks, and were marketed under "good" grade. M.I.A. Granny Smiths came in rather early and were sold mainly as cooking apples, because of immaturity.

In later consignments, many were heavily affected by sun-scald. The majority of applies grown at Orange were severely affected by hail mark and a big percentage of most consignments were marketed under "good" grade.

Queensland fruit also was mostly of "good" grade, due to hail damage. Victorian apples have been better than for some years; quality and colour were very good. Tasmanian fruit has been plentiful; but had also suffered heavily by hail damage, and many consignments were forwarded under "good" grade.

Pears.—Heavy supplies of very poor quality "good" and "domestic" grade pears came forward from Victoria towards the end of the 1959 season. Many consignments were practically unsaleable due to severe limb rub, hail mark, ice-scald and malformation. Supplies from the Orange and Batlow districts were light towards the end of last season, but of excellent quality and condition.

A big quantity of W.B.C. and Clapps pears arrived from Victoria early in the season, mostly immature, unwrapped, and sometimes poorly branded with trade descriptions. Later arrivals of Packhams, and Josephines, showed a marked improvement. Orange and Batlow pears have been of excellent quality and condition, and mostly were large. Many consignments from the Lakesland district were severely affected by black spot; some practically unsaleable.

Citrus Fruits.—A programme of testing new season Navel oranges for maturity was maintained, with pleasing results. Less than 50 cases were withheld from sale at the City Markets for failing to meet the required standard. Quality and appearance were very good throughout. Few second crop Navels were marketed. Some of these failed to meet the juice content standard and were withheld from the retail trade.

Throughout the season the supply of Valencias from all areas was very heavy. Their quality was very good—even towards the end of the season. Some lots very late in the season showed heavy red scale infestation.



Bulk-handling the Apple Crop, from Trees to Packing Shed

Bulk-handling has notably expanded this season. Orchardists who have adopted it report appreciable savings in handling costs. District fruit officers have had a leading role in development of local units and installations.

Heavy supplies of local Valencias were marketed in October and November, due, it is assumed, to the threat of black spot. This was borne out later, when from mid-December a big percentage of the fruit was forwarded under "good" grade due to black spot infestation. Towards the end of the season mould and decay caused rather heavy losses.

Apricots.—Supply was plentiful from the Kurrajong district, but quality and size of fruit were poor. Many lots were badly marked and cracked, and hard to sell. From the M.I.A. and South Australia the fruit was of good quality and appearance.

Peaches.—In many consignments, early peaches were small, and badly affected by brown rot fungus. Towards mid-season the quality improved and brown rot was not nearly so prevalent. Fruit from the Bathurst district was of good size and excellent quality.

Plums.—The market was heavily supplied with Wilson and Santa Rosa plums, most very small; whilst Narrabeens were scarce throughout the season but were of good size and quality.

Cherries.—Very good quality cherries were marketed from all districts, and no evidence of row or bunch facing was found.

Strawberries.—Queensland strawberries came forward in good quantity. The condition and quality were good, and topping of punnets was much less than in previous years.

Grapes.—This was an exceptionally good, extended season; the market being well supplied with grapes of excellent quality and condition in all varieties. On being tested for maturity early in the season, all lines met the required standard.

Fruit Fly.—By comparison with recent years, fruit fly infestation at the markets was moderately light.

Potatoes.—The main supply of potatoes came from Tasmania, Victoria and New South Wales, with lesser quantities from Western Australia, Queensland and South Australia. Tasmanian and Victorian potatoes were, in the main, of particularly good quality. Little trouble was found with them until near the end of the season. Then an occasional lot showed potato moth infestation. The consignments were well presented, in good quality bags and well branded.

From Queensland, some consignments of new potatoes showed scald and slight moth infestation but generally were satisfactory. Western and South Australian consignments were very good, except that towards the end of the season some Western Australian lots were somewhat old and shrivelled. There was a big decrease in potatoes from N.S.W. districts, and mainly they were not up to the standard from other States for quality, freedom from disease, grading and branding.

DISTRICT AND SUBURBAN INSPECTIONS

Fruit Fly.—This again caused a lot of concern throughout the State. There were renewed outbreaks at Narromine, Leeton, Griffith, Jerilderie, and Albury, affecting, in respect of the New Zealand market, citrus areas of the Murrumbidgee Irrigation Areas and Upper Murray districts.

As a result of continued freedom from fly in the Lower Murray areas, it was possible to dispense with the 100 per cent. inspection service, at Dareton, for citrus intended for Victorian markets.

In co-operation with the Victorian Department, a twenty-four hour road block was maintained at Euston for the period October, 1959, to 30th April, 1960. At this inspection point 105,293 vehicles were inspected, and 6,310 carried fruit. Only eleven instances of infested fruits were recorded. This inspection point will be continued on a 24-hour basis again from October, 1960, to May, 1961. The buildings and facilities required to place it on a permanent basis are estimated to cost £13,650, of which this Department will provide half.

Localised outbreaks of fly in Leeton and Griffith were brought under control quickly. Local fruitgrowing interests co-operated. They supplied labour and material for systematic direction by Departmental officers.

Fruitgrowing interests of the M.I.A. are seriously concerned by the fruit fly hazard. A conference of local organisations was convened to discuss the problem with senior Departmental officers at Leeton on 8th June, 1960. A proposed permanent scheme whereby future prevention and control treatments can be implemented as a service has been accepted in principle by M.I.A. interests. Finance for the service remains to be determined, but may be available for 1960-61 in the treatment at least of Narrandera, Leeton and Griffith.

This Division has supported a project designed to test the practicability of effectively reducing male fly population by systematic baiting with a new male-attractant. The town of Richmond has been selected, and this large-scale trial should provide valuable data.

Availability of new and effective materials for fruit fly control has gained greater co-operation from the home gardener. Introduction of Rogor 40, in particular, a pre-harvest treatment, has aroused fresh interest and given good results.

A further advance was made when the present fruit fly Proclamation was amended to provide that prescribed treatments for fruit fly control shall now apply to the whole of the State. Previously, only certain sections of the State were included. This amendment will facilitate inspectional work.

Citrus Gall Wasp.—No infestation of commercial areas has yet been detected in Cumberland. A thorough inspection of all commercial nurseries and resellers in the Metropolitan area has been completed, and intensive inspections of perimeter areas are proceeding. The inspections commenced two months earlier than in 1959, and very successfully prevented distribution of infested trees. The inspections also determined the outer limits of infestation. Nine inspectors were in this work.

Potato Inspection.—The annual check on potato growers' licenses under the Potato Growers Licensing Act was carried out in all districts to good effect.

Inspections of potatoes under the Plant Diseases Act and on behalf of the Certified Seed Potatoes Co-operative (New South Wales) Ltd. were also maintained.

Banana Bunchy Top Control Scheme.—In conjunction with the Banana Growers' Federation, the disease control scheme was continued satisfactorily. Removal of the last remaining plantation with a bunchy top history at Harwood Island now confines the present bunchy top area to north of the Richmond River. All areas south of the Richmond are now free of bunchy top, including the Clarence, Coff's Harbour and Nambucca districts. This was made possible by the Banana Growers' Federation agreeing to purchase and destroy the Harwood plantation and willingness of the owner to co-operate.

Bunchy top incidence has been brought to the irreducible minimum by present methods of control. Further progress would seem dependent upon progressive eradication of plantings with a disease history, and rigid control of planting material to provide plants only from plantations with an established history of freedom from bunchy top. This policy is now being implemented.

Bunchy top incidence in 1959-60 was 1,829 plants in a total area of 29,944 acres. This compares favourably with 2,692 plants in 29,659 acres during 1958-59.

Operational costs of the Control Scheme, to the Banana Growers' Federation, were £35,000 for the year.

Quarantine Regulations.—Regulations under the Irrigation Act were policed in the M.I.A. by means of continuous hawkers and shop inspections and periodical road blocks. This difficult task was aggravated by non-co-operation of certain people within the M.I.A. They take advantage of quarantine measures to exploit high prices for contraband fruit, when the fruit concerned is not legally available in the M.I.A.

Prosecutions and Warnings.—There were ninety prosecutions for breaches of regulations under the Plant Diseases Act, and 184 letters of warning were issued in respect of first offences. There were nineteen prosecutions under the Potato Growers Licensing Act.

Amendments to Proclamation and Regulations.—The following amendments to Proclamations and Regulations under the Plant Diseases Act, 1924, were gazetted:—

Amendment of the Fruit Fly Proclamation, to expand prescribed pre-harvest treatment to the whole of the State;

Amendment of Regulation 41, requiring compulsory dipping of packed bananas throughout the year instead of the previous limited period from May to November;

Apple Grading Regulations, by inter-state agreement revised to conform to all other States.

Market Inspections.—Inspectional work in Metropolitan and Newcastle markets has been maintained. Liaison between market and field inspectors has achieved prompt remedial action at the growing end, and reduced repetitive offences.

Citrus Maturity Testing.—This service has been given by officers in the main citrus areas with good effect. It has now become firmly established and is recognised by growers as a routine procedure.

Grape Vine Nematodes.—Recent appreciation of damage caused by nematodes to vine plantings, particularly along the Lower Murray, emphasised the importance of preventive action. Officers inspected all vine rootlings produced in Lower Murray nurseries, and rejected 6,000 plants from a total of 62,000 inspected.

Immature Table Grapes.—As a result of a successful campaign in 1959 and again this year, very few consignments of table grapes were rejected for immaturity at the markets.

Extension Activities in Horticultural Industries

Overall extension services rendered by the Division comprised a heavy programme. Some of the matters which received special attention were:—

Low Volume Misting.—Development of low volume misting treatments for control of leaf spot and speckle diseases in bananas has now become generally accepted. Considerable effort has been made to guide growers in their use, through field days, group instruction, and visits. Field days were held in each of the main banana growing districts, with large attendances.

Bulk Handling.—Following a visit to Tasmania and Victoria by a party of growers from Orange district, accompanied by the district fruit officer, to study bulk handling methods with pome fruits, the system has considerably progressed in that district. Ten leading growers have already introduced the method to their orchards, and the district fruit officer has had a leading role in development of local units and installations.

Other fruitgrowing districts have exhibited keen interest in the system. In anticipation of demand for guidance, seven district fruit officers visited Orange for observations and discussions of the various types of installation. This information is already being extended to good purpose.

Black Spot Warning Services.—The apple black spot spore warning service initiated by the Department has proved of great benefit to growers in the Batlow and Orange districts. Growers have come to rely confidently on spore movement warnings issued by the fruit officer, as determined by the "Hirst" spore trap.

Contour Planting.—District fruit officers have rendered a contour planting lay-out service in all districts. Most fruit tree plantings over the past decade have been planted to this system, resulting in almost complete elimination of soil erosion problems in those orchards.

"Dead Arm" in Grape Vines.—A special campaign covered the M.I.A., to control "Dead Arm" in grape vines. This followed results in Departmental trials demonstrating 100 per cent. control with a single dormant spray of sodium arsenite.

Virus-free Grape Vine Cuttings.—Considerable assistance was given to growers in locating infected grape vines and selection of virus-free planting material.

Black Spot Control in Citrus.—Improved control was the object of an extension campaign in the Gosford and Cumberland districts. In co-operation with Division of Science Services, two field demonstration areas have been established at Gosford and Wyong.

Drainage.—Interest has been maintained in underground drainage for irrigated orchards of the M.I.A. and Lower Murray districts. Extension information on the subject has been maintained also in coastal areas, but drier seasons have reduced growers' interest.

Farm Design and Irrigation.—Development of new horticultural areas at Cudgell Sandhills in the M.I.A., and at Buronga, Paringi and Mourquong on the Lower Murray, has called for considerable help in farm design and irrigation lay-out.

Citrus Fruit Processing.—The advantages of recommended methods for improved appearance and keeping quality, derived from research at the Citrus Wastage Laboratory, have been generally accepted by the citrus industry. As a result of sustained extension, treatment plants have been installed by packing houses and individual growers.

Prune Harvesting Maturity.—Extensive use was made of the refractometer as an indicator of prune maturity, and many growers are now using this guide to harvesting.

Demonstration Plots.—A wide range of stone fruits, including new and improved varieties, have been planted in district plots throughout the State. They are to establish the economic stature of these fruits under varying climatic and cultural conditions.

Disease Surveys.—In association with Division of Science Services, State-wide surveys of stone fruits were carried out in respect of virus diseases, bacterial spot of peaches, and cherry leaf spot. Valuable data were obtained. In regard to cherry leaf spot, it was found that drastic action taken some years ago has apparently eliminated this disease.

Warning Service—Oriental Peach Moth.—In association with the district entomologist at Leeton, a trapping scheme was maintained and a special moth activity warning service was rendered to the M.I.A.

District Pest and Disease Control Programmes.—Spraying programmes have been prepared in co-operation with Division of Science Services and distributed for local application in the following fruitgrowing districts: North Coast (tropical fruits); Murrumbidgee Irrigation Areas; Gosford; Orange.

Soldier Settlements.—Officers of the Division continued to act on advisory committees in respect of Soldier Settlements at Willigobung and Coomealla. Ellerslie committee was disbanded.

Fruit Packing Instruction.—Packing advice to growers of all kinds of fruits is very necessary. It has been a comprehensive field of extension. Under the Commonwealth Agricultural Extension Grant an officer has been fully engaged in this work.

Packing demonstrations were given at Bathurst, Batlow, Glen Innes, Tenterfield, Camden, Bilpin, Oakdale and Wilberforce. Attendances ranged from ten to thirty-two. Individual instruction has been given in areas where organised demonstrations were impracticable. Instructions were given individually to fifty-two packers and growers. Where individual instructions have been given the general presentation of the fruit has improved, to the mutual benefit of the agents, buyers and growers. The beneficial results of premium packs have been premium prices.

In conjunction with the Tasmanian Department of Agriculture, the development of a volume-filled pack in a new type of fruit case has been investigated.

Research for the Horticultural Industries

SUMMARY

- (1) High-quality grapes and table wine have been produced from experimental plantings at Molong.
- (2) Gibberellic acid increased sultana berry size by 27 per cent. and loosened the bunches of Hunter River Riesling.
- (3) Single applications of monuron and simazin give promise for weed control in vineyards.
- (4) Polythene case liners and bunch wraps impregnated with sodium-ortho-phenylphenate considerably improved cool storage results with grapes.
- (5) Phillips, Fairless and Golden Queen canning peaches outyield thirteen varieties under test at Yanco Experiment Farm.
- (6) Plum stocks selected by the Department, Buck plum (PH5) and Marianna selection (PS1A), have proved superior to other stocks.
- (7) Incidence of Internal Breakdown of apricots was influenced by fertiliser applications.
- (8) Significant increases in prune yield and fruit size were obtained by use of potassic fertiliser in the Young district.
- (9) Sodium salicylanilide in wax significantly reduced stem end rot in treated oranges.
- (10) Ammonia gas gave control of mould in citrus degreening chambers.
- (11) The Kara mandarin shows promise as a late ripening type.
- (12) Carizzo citrange and Cleopatra mandarin are promising citrus rootstocks.
- (13) Control of banana root rot is improved by heat treatment of planting material.

(14) Bananas can be stored for eight weeks by treatment with sodium salicylanilide and "mycostatin" and storage in polythene bags.

(15) The insecticide "sevin" has promise as a thinning agent for apples.

(16) The Department's apple selection BB122/21 was released, and named "Redbow".

COMMITTEES AFFECTING RESEARCH

Commonwealth Dried Fruits Processing Committee.—This advisory committee comprised representatives of the C.S.I.R.O., Commonwealth Department of Primary Industry and the Departments of Agriculture of Victoria, South Australia and New South Wales. They deal with all technical aspects of the dried fruits industry. The 1959 annual meeting was held in Adelaide. This was the seventy-fourth meeting. Special attention is now being given to rack dehydration of grapes, and to packaging of high moisture content prunes.

Australian Canning Convention.—An officer of the Division of Horticulture was in the Secretariat responsible for planning and organisation of the Tenth Australian Canning Convention, held in Sydney in September, 1959. About 160 representatives of growers, canners, technologists and other sections of the fruit and vegetable canning industries attended. The Conference theme was Marketing of Australian Canned Foods. An officer of the Division of Horticulture presented a paper on world-wide trends in planting and production of canning fruits.

N.S.W. Canning Fruits Advisory Committee.—This committee, representatives of canners and growers with an officer of the Division of Horticulture as Chairman, was established by the Canning Fruits Industry to progressively review canning fruit plantings and to make recommendations to the industry. It has recommended a target production of 20,000 tons of canning peaches for the Murrumbidgee Irrigation Areas and, as it considered that the tree populations to achieve this production in the near future are already planted, has further recommended that annual plantings be restricted to those sufficient to replace annual removals.

Co-ordination Committee for Fruit and Vegetable Storage.—This committee, representatives of the Commonwealth Department of Primary Industry, the C.S.I.R.O., and the six State Departments of Agriculture, did not meet in the past year.

Fruit Cool Storage Investigations Advisory Committee.—The committee, representatives of the C.S.I.R.O. Division of Food Preservation and Transport, the Sydney University, and the Division of Horticulture, did not meet in the past year.

Citrus Wastage Research Committee.—This committee, a subcommittee of the Fruit Cool Storage Investigations Advisory Committee, met twice, to review and plan the work of the Citrus Wastage Research Laboratory at Gosford.

Considerable progress has been made with the control of mould in orange degreening rooms, by introduction of ammonia gas. This year the committee had the co-operation of officers of the Victorian Department of Agriculture in a comparative investigation, in the Lower Murray citrus districts, of wrapped and naked fruit treated with S.O.P.P. and wax.

Committee for Co-ordination of Research in Fruit and Vegetable Processing.—This committee had previously comprised officers of the C.S.I.R.O. Division of Food Preservation and Transport and this Department, but two additional appointments were made to include representation from the processing industry.

The committee met twice this year. It appointed a subcommittee to consider means of extending its liaison Australia-wide. Significant fruit problems discussed included canning and freezing of berry fruits and the packaging of high moisture content prunes.

Deciduous Fruit Tree Improvement Committee.—This committee, comprising officers of the Division of Horticulture and the Biology Branch, Division of Science Services, has the object of controlling the spread of virus diseases in the deciduous fruit tree orchards of the State and, in particular, to prevent the propagation of infected trees.

During the year the Committee commenced a survey of the distribution of virus diseases in the deciduous fruit tree orchards and fruit tree nurseries in the main fruit-growing districts. The Committee also inspected, for freedom from virus diseases, all sources of propagating material used by three fruit tree nurseries.

Fruit Tree Nutrition Committee.—This committee was inaugurated during the year to co-ordinate research in fruit tree nutrition. It comprises officers of the Division of Horticulture and the Biology and Chemistry Branches, Division of Science Services. Two meetings of the Committee were held and current projects were surveyed.

Technical Committee on Fruit Fly Sterilisation Investigations in Citrus.—This Committee, comprising representatives of the Commonwealth Department of Primary Industry, the C.S.I.R.O., and the State Departments of Agriculture of South Australia, Victoria and New South Wales, directs the fruit fly commodity-treatment investigations. The work is centred at the Citrus Wastage Research Laboratory, Gosford. The Committee met once. Currently, particular attention is being given to fumigation at temperatures below 70°F.

RESEARCH LABORATORIES AND EXPERIMENT FARM ORCHARDS

Details of research projects at these institutions are given later, under the headings for respective fruit industries.

Yanco Experiment Farm Orchard.—This is the main centre for research into production of deciduous fruits under irrigation conditions, but research into citrus problems is also considerable there. All bearing-plantings produced heavy crops. The net sales return from all fruit sold was £5,370. Production of *Phylloxera*-resistant vine cuttings totalled 28,830. New experimental plantings were made. They include 784 citrus trees for strain and rootstock trials of Ellendale mandarin and Washington Navel and Valencia oranges, and 572 trees for a Granny Smith apple rootstock trial. Propagations of twenty-four new varieties of clingstone and freestone peaches, and fourteen scion-rootstock combinations of apricots, were made for trial purposes. Material is on hand to extend irrigation reticulation in the new orchard area.

Wagga Agricultural College Orchard.—This orchard is undergoing extensive reconstruction to improve its value for student instruction.

Hawkesbury Agricultural College Orchard.—This orchard is undergoing extensive reconstruction to improve its value for student instruction. New plantings involve a range of new stone fruit varieties, for observation as well as instruction.

Griffith Viticultural Nursery.—The programme has been severely curtailed for a number of years, due to salt damage. Recent investigations have demonstrated the high value of the land for tile drainage research. Detailed plans have been prepared for its development as a centre for viticultural and tile drainage research. Officers at the Nursery are undertaking on private orchards a limited research programme in tile drainage and viticulture. The problems of agronomic response to tile drainage, and of vines' responses to various irrigation and pruning treatments, are being investigated.

Gosford Citrus Research Station.—Good progress has been maintained. Development of the irrigation system is well in hand, and a dam with a capacity of 6,340,000 gallons is nearing completion. New plantings were made in both the Somersby and the Narara Sections, being 78 trees and 280 trees respectively. In the viticultural nursery, 74,150 cuttings were planted in 1959 and 51,850 cuttings were stratified for planting in 1960. Vine rootings lifted totalled 37,950. A citrus virus screening project was the major new work undertaken.

Citrus Wastage Research Laboratory, Gosford.—Citrus wastage investigations are programmed by the Advisory Committee (see earlier). They include trials in co-operation with the Victorian Department of Agriculture, related to the export of oranges from the Lower Murray area. Other trials relate to the influence of bulk handling on injury and wastage; screening of fungicides for green mould control; testing of the established sodium ortho-phenylphenate treatment for control of black spot development; and use of fungicides to prevent stem-end rot.

Considerable progress has been made in control of green mould wastage in degreening chambers, by introduction of ammonia; and in sterilisation of oranges infested with Queensland fruit fly, by fumigation with ethylene di-bromide.

Lower Murray Research Station Orchard.—This is the centre for investigations related to citrus production in the Lower Murray area. Citrus plantings were increased by 7 acres, to a total of 20 acres. A further 8 acres has been cleared, and spray irrigation was installed on another planting of 3 acres. Investigations in progress relate to citrus stock and variety testing; stem-pit of grapefruit; citrus propagation methods; and strawberry and stone fruit varieties.

Bathurst Experiment Farm Orchard.—This is the centre for pome fruit investigations; particularly those related to central tablelands conditions. Satisfactory crops of good sized fruit were produced from all plantings, although a hailstorm resulted in some loss. A considerable proportion of the plantings comprises rootstock trials. Some of these have been in progress for over thirty years. Particular attention is also given to the associated problems of alternate bearing and thinning. Other investigations relate to spray residue removal; pollination of cherries and plums; and propagation of Buck plum cuttings.

New England Experiment Farm Orchard.—A large section of the orchard has remained under soil renovation treatment, preparatory to planting a new series of trials. Some of these have been planned for 1960-61.

Tropical Fruit Research Station, Alstonville.—There has been good progress in development of this new Station. A micro climatic survey of the area was undertaken to determine the planting limits for bananas and other crops. Investigations of the flow rate of the creek in relation to rainfall have been carried out continuously. A detailed land-use plan has been prepared, to site the various plantings proposed; and a soil conservation plan is being prepared by the Soil Conservation Service. Provision of domestic water supply has been effected; and the final stages of investigation for construction of the proposed irrigation storage dam are in progress. Plantings related to investigations with pineapples, pawpaws and avocado have been made.

Homebush Cool Storage Laboratories.—Officers of this Division of Horticulture are located at the Homebush Laboratories of the C.S.I.R.O. Division of Food Preservation and Transport. There, co-operative investigations are undertaken into cool storage problems, particularly in relation to apples and pears.

RESEARCH, ON A FRUIT INDUSTRY BASIS

Research—Citrus Industry

Control of Wastage in Citrus Fruit.—Investigations into control of wastage in citrus fruits continued at Gosford Citrus Wastage Research Laboratory, operated jointly by the C.S.I.R.O. and this Department.

Elimination of Wrapping for Export.—Co-operative studies with the Victorian Department of Agriculture, on the value of a double sodium ortho-phenylphenate treatment, were inconclusive. Further work is intended.

Bulk Handling Injury.—Work on the influence of bulk handling on fruit injury commenced.

Fungicides for Mould Control.—Screening of fungicides for green and blue mould control continued. Chemicals tested included "cetaulen", "hibitane", "mylone" and "mel-prex". "Mylone" warranted further testing.

Control of Stem-End Rot.—Sodium salicylanilide, in wax applied after S.O.P.P. dip and rinse, significantly reduced Stem-end rot; Borax-Boric Acid in wax did not.

Control of Citrus Black Spot Development.—There were indications that waxing and other treatments that reduced moisture loss from the fruit reduced the development of spots on the rind.

Control of Mould in De-greening Chambers.—Ammonia gas in combination with the ethylene gas gave promising results. Difficulties encountered in metering the ammonia were overcome.

Fruit Fly—Sterilisation of Fruit.—The efficiency of ethylene di-bromide as a fumigant at temperatures of 50°F. to 70°F. was tested, as part of the investigations undertaken in association with the Technical Committee for the Sterilisation of Citrus Fruit for Fruit Fly.

Wrenching of Nursery Trees.—At the Lower Murray Research Station, preliminary trials indicated that cutting the tap roots of nursery trees, without removal from the ground, increased fibre root development near the tree butt and improved establishment at planting.

Citrus Breeding.—Selections have been made from the breeding blocks at Yanco Experiment Farm. They are to be tested as rootstocks and scion varieties. Kara mandarin showed promise in farmer plots; as a late ripening mandarin unaffected by granulation, and with good yields and juice content.

Rootstocks for Old Land.—Carrizo citrange has produced vigorous trees budded to Valencia at Gosford, but has shown some intolerance to frost at Yanco. Rough lemon rootstocks failed at Yanco after five years. Trees on Narara citrange were stunted and unhealthy at Gosford.

Citrus Rootstock Investigations.—Co-operative trials with farmers in the main citrus growing centres have provided useful indications of rootstocks suitable for particular conditions. Cleopatra mandarin is a promising rootstock for Emperor mandarin at Wiseman's Ferry, for Valencias at Griffith, for Eureka lemon at Mangrove Mountain, and for Washington Naval at West Pennant Hills.

Trifoliata has increased the degree of alternate cropping in mandarins; adversely affecting fruit size in "on" years. It remains satisfactory for grapefruit, and Washington Navel and Valencia oranges on loamy soils. It is slightly less satisfactory on sandy soils. It reacts unfavourably to extreme acidity and alkalinity as well as salt.

Citrus Improvement Selections.—Selections of citrus scion varieties free of scaly butt virus have been maintained and expanded. A selection of Shamouti developed scaly butt symptoms.

In Yanco Experiment Farm trials, of a number of lines of trifoliata rootstock and a number of bud lines of Washington Navel and Valencia oranges and Marsh and Thompson grapefruit, there is positive evidence of influence from bud line; but the effect of stock line is extremely slight.

Scaly Butt and Stunting.—Two selections of Marsh grapefruit free of scaly butt symptoms, but showing two levels of stunting, together with a non-stunted line, were inoculated with scaly butt infected buds. Inoculated trees showed growth restriction in all instances, but the effect was greatest on the non-stunted lines. This suggested a possible relationship between scaly butt and stunting.

Sudden Death.—Root inoculation of a wide range of citrus species with *Coprinus* spp. has indicated that Cleopatra mandarin is more resistant than other lines tested.

Scaly Butt and Yellow Ring of Lemons.—At Yanco Experiment Farm, Lambert, Cambourne and Scott nucellar lemons on trifoliata rootstock are not showing any decline after 7 years, despite the presence of yellow ring. At Gosford there are indications that all old line Eureka selections are infected with scaly butt, and that all nucellar Eureka seedlings are prone to yellow ring.

Resistance of Trifoliata to Waterlogging. Seven strains of trifoliata were compared for resistance to waterlogging, when grown in pots containing soil from the Windsor district. Complete immersion for eight weeks resulted in death of some roots, but no strain influence was detected.

Reworking.—At Gosford, Bitter Sweet Rough Seville, and Eureka, Lisbon, Lambert, and Nucellar Eureka lemons were largely incompatible as scions for reworking mature Valencia and Washington Navel trees.

Trifoliata Propagation.—Extraction and storage of trifoliata seed were further investigated. Best results were obtained from freshly-extracted seed stratified in damp sand. No difference was observed between transplantings made in July and September from seed-bed to nursery row.

Virus Screening Plots.—Screening plots were established for 38 mother trees, to test for the presence of xyloporosis and psorosis.

Research—Tropical Fruit Industry

Root-rot in Bananas.—Incidence of root-rot in bananas has reached serious proportions and is causing much concern. The nematode *Radopholus similis* is now accepted as the primary pathogen, and movement of infected plant material is the main means of spread. A control scheme has been evolved, based on heat treatment of planting material and the use of uninfected land.

Banana Packing Trials.—Different shapes of bushel cases have been tried. The trials are now on a commercial scale at Sydney, Melbourne and Brisbane markets.

Extending the Green Life of Bananas.—In co-operation with the Biology Branch, treatment of clusters of green bananas with 98 per cent. sodium salt of salicylanilide and mycostatin have been tried. After dipping, the clusters are sealed in polythene bags. Bananas when so treated can be held for eight weeks, at a temperature of 53° F.

Investigation of Cavendish Bananas Winter Production.—Observations on peeper suckers selected at approximately the three-leaf stage, i.e. about 2 inches high, were continued until harvesting. Suckers taken at the three-leaf stage in late December, January, February, and March produced the greatest percentage of winter fruit harvested from June to September.

Cercospora Leaf-spot and Speckle of Bananas.—A four-spray Bordeaux mixture programme was compared with low volume oil sprays for control of *Cercospora* leaf spot, and Speckle. Control was very satisfactory with both programmes. *Cercospora* leaf-spot and Speckle were present in all sections but incidence was only slight.

Comparative, annual per acre costs were £11 3s. 0d. for low volume oil sprays and £18 18s. 0d. for the Bordeaux programme.

Avocados.—Variety trials are continuing. Many trees are suffering from root disorder caused by *Phytophthora cinnamomi*. Work has been undertaken in an attempt to control this disease.

Avocado Varieties.—Scion wood of the avocado varieties Hass, Lutano, Jolna, Mexicala, and Edrial, was obtained from the Redland Experiment Station.

Passionfruit Brown Spot Control.—Following the apparent eradication of brown spot from a trial area at Duranbah Plot, by mercuric chloride, by ground and foliage sprays, treatment was extended to an isolated one acre trellised crop. After six months the area remained free of infection. If further trials confirm this result, then one eradicant spray applied at flowering could be expected to replace the present three or four-spray Bordeaux mixture programme.

Passionfruit Seed Extraction.—Trials strongly suggest that 14 days after ripening before extraction has an advantage over seed extracted from fresh fruit or seed allowed to remain in the fruit for long periods.

Passionfruit Root and Collar-Rot Studies.—A trial has been established to demonstrate the resistance of the Hawaiian Golden passionfruit stock to the root rot and collar rots, to which the seedling Purple Edulis passionfruit is susceptible. The trial comprises an interplanting of Purple Edulis on Hawaiian Golden passionfruit stock, seedling Purple Edulis and Hawaiian Golden passionfruit seedlings.

Macadamia Nut Selections by Marcotting.—Marcotting of Macadamia nut tree selections has resulted in production of roots. The marcots have been removed from the trees and planted out under bush-house conditions.

Research—Pome Fruit Industry

Spray Residue Investigations.—Concern expressed in export markets over the possibility of toxic spray residues on fruit was a factor leading to installation of an experimental fruit-washing machine at Bathurst Experiment Farm. Co-operative work with the C.S.I.R.O. and the Chemistry Branch of this Department, has proceeded in the past season.

Apple Breeding.—The seedling selection phase of this work was terminated. The selection BB122/21 was named "Red-bow". It has been released for field trials in this and other States. Two other selections show promise and will be tested further. Two chance seedlings, from Penrose and Batlow, have been released for field trials, together with three strains of Red Delicious imported from U.S.A.

Thinning Effect of "Sevin" Insecticide.—Co-operative trials in association with Dr. L. P. Batjer of the United States Department of Agriculture, indicated that sevin, applied at normal insecticidal strengths, between 10 and 25 days after full bloom, acted as a thinning agent. The results have been submitted for publication.

Apple Rootstock Trials.—At Bathurst Experiment Farm, trees 30 year old on Northern Spy continue to out-yield other rootstocks for Granny Smith, although the tree is somewhat smaller. Trees of Democrat on Northern Spy are much smaller, less vigorous, and lower yielding than those on seedling rootstock. Yield from Jonathan and Delicious trees raised by layering were not different from those from trees on highest yielding East Malling stocks.

Jonathan has given particularly good yields of high-quality fruit on EM I and EM XIII. Delicious has performed most satisfactorily on EM XII. East Malling stocks have imparted considerable tree vigour to Grany Smith; but crops and fruit size have been very irregular, particularly under adverse conditions.

Pear Rootstock Trials.—Yields from trees on *Pyrus calleryana* strains continue to be outstanding, particularly in the case of the Departmentally selected D6 and PC4 strains.

Research—Stone Fruit Industry

Cherry Investigations.—Numerous trial plantings of new varieties, and rootstocks, have been made in all the main cherry-producing areas. Several large plantings are to be made to test the value of certain rootstocks, and height of working, in minimising damage from bacterial canker.



Developing a Berry Industry at Batlow

A berry growing industry is being developed successfully at Batlow. The fruit is processed at Batlow cannery. The district has been shown to be ideally suited if the plantings are well cared for, and if supplementary irrigation facilities are provided for when required. Last season, a record of 32,000 lb. fruit from a well-managed 2½ acre planting was achieved by a grower.

Stone Fruit Variety Trials.—Further varieties of apricots, and canning and dessert peaches, were introduced. All overseas material is being screened for virus diseases. Several promising local peaches, apricots and plums are to be included in district trial plots for the first time. Additional trials were planned to test the value of stone fruit varieties in reconstructed former citrus orchards.

Canning Peach Variety Trial.—All trial varieties at Yanco Experiment Farm carried heavy crops. Phillips, Fairless and Golden Queen yielded highest of the 16 varieties under test. Canned samples are to be assessed by industry representatives at a Canning Conference. Latest varieties and several promising seedling selections planted in a new trial in 1958 are well established.

Peach Pruning and Thinning Trials.—There has been no apparent difference in fruit yield between trees pruned on different systems. Thinning was not necessary, but trees yielded very well.

Plum, Prune, and Apricot Stock Trials.—Old established trials continued to show the value of the Buck plum (PH5) developed by this Department, as a rootstock for d'Agen prune and European plum trees growing in inland areas. The Department's Marianna selection, PS1A, is proving superior to other stocks for Japanese plums. Plum, peach, and apricot stocks are being tested with apricot varieties for resistance to root-rot and nematodes. Newly introduced plum stock material is being increased.

Stocks for Peaches.—Plums which could prove useful as rootstocks for peaches are being propagated for future trial plantings. Seed of Rutgers and Kingston Red Leaf Peaches, which have a good reputation in America, have been imported.

Internal Breakdown of Apricots.—Incidence of breakdown was low, but trends noted in previous years were again apparent. Considerable yield response was obtained from 16 lb. sulphate of ammonia, but incidence of breakdown was highest in this treatment. Trees receiving no sulphate of ammonia yielded as well as those that received 8 lb. sulphate of ammonia; and showed the least amount of breakdown. Fruits from the no-sulphate trees were too small for commercial use.

Prune Irrigation and Pruning Trials.—Trees which were not allowed to wilt before irrigation produced the greatest amount of fruit, of slightly better size than other treatments. Biennially pruned trees produced more fruits than annually pruned trees, but fruit size was smaller.

Prune Harvesting Maturity.—Exploratory investigations to test the value of refractometer readings as an index of maturity were commenced at Young.

Prune Fertiliser Trials.—Previous trials at Young demonstrated that all treatments with nitrogen and phosphate increased yields. New trials were established in 1958 to explore the value of potash. Though leaf analyses showed only slight differences in the level of potassium in prune leaves, significant increases in yields and fruit sizes have been obtained with a mixed fertiliser containing potash; particularly when in conjunction with magnesium carbonate.

Research—Grape Industries

Phylloxera-resistant Rootstocks.—Sales of *Phylloxera*-resistant rootstocks for the 1959 planting season amounted to 43,595, compared with 21,915 in 1958. Even though sales were doubled, the number of rootlings available was inadequate to satisfy the demand. Orders reached the record level of 79,000, compared with 63,265 in 1958.

The increased quantity of rootlings produced reflects the effect of the mother vine replanting programme commenced at Yanco Experiment Farm and Gosford Citrus Experiment Station in 1957. These vines are not yet in full production. By 1962 there should be no shortage of grape rootstocks.

Orders for the 1960 planting season amounted to 60,740. A new procedure, whereby growers are required to place orders for rootstocks a year in advance, has been implemented to avoid the likelihood of surplus stocks being propagated.

Trial of Wine Grapes at Molong.—Approximately one ton of grapes was harvested from the experimental plot at Molong. This was established to test the suitability of the district for producing quality table wines. The crop was processed at Penfold's Rooty Hill cellars. Quality of the grapes was good, and showed a high sugar test. Wine from the 1959 crop has

been bottled and is developing satisfactorily. The 1959 vintage wine, which is reaching maturity, was highly appraised by prominent wine tasters at a "blind" testing held during the year. The lease on the experimental plot has almost expired and no further crops will be processed.

Introduction of Grape Varieties.—Two wine grape varieties, Sylvaner and Gamay Beaujolais, and one *Phylloxera*-resistant rootstock, ARG1, were imported from California. The wine grape varieties are suitable for production of quality table wines, while ARG1 is regarded as being the most outstanding rootstock variety in California. In addition, cuttings of eight introductions of wine and table grape varieties recently released from quarantine in Victoria have been obtained and propagated.

Rootstock Trials for Table Grapes.—A second trial to test eight different rootstocks for Black Muscat table grapes was planted in the Chipping Norton district. Vines in the first trial planted at Orchard Hills in 1958 have developed satisfactorily. Those on 106.8, 62.66, and du Lot rootstocks seem superior to the others.

Trial of Gibberellic Acid on Sultanas.—Gibberellic acid was applied at 5, 10, or 20 p.p.m., at both the full bloom and shattering stages. The results showed a progressive increase in berry size as the concentration was increased. Shattering-stage applications were more effective than those made at full bloom. The 20 p.p.m. shattering spray increased berry size by 27.2 per cent. over that of untreated vines.

Trial of Gibberellic Acid on Wine Grapes.—Applications were made to Hunter River Riesling at bud-burst, at one month after bud-burst, and at full bloom; at concentrations ranging from 1 to 40 p.p.m. Sprays of 5, 10, and 20 p.p.m., applied one month after bud-burst, loosened bunches considerably. The effect increased with concentration, due to elongation of the pedicels and an increase in the number of shot berries. Yield was equal to or greater than for untreated vines. Full bloom sprays of 10, 20 and 40 p.p.m., also loosened bunches, but to a lesser extent. Bud-burst sprays of 1, 5, and 10 p.p.m. had no effect. No wet weather was encountered and the effect on mould damage could not be assessed.

Improving the Strike of *Phylloxera*-resistant Cuttings.—Experiments conducted in 1958-59 involved the dipping of cuttings in the hormone NAA, spraying mother vines with 2, 4, 5-T, dipping cuttings in Bordeaux mixture, and a comparison of stratified and unstratified cuttings. They failed to show any significant differences in strike between treatments.

In 1959-60 the strike of cuttings made in May, June, and late July were compared when dipped in a solution of 0, 500, and 2,500 p.p.m. indole butyric acid and stratified for 0 and 6 weeks. As a result of the excellent growing season, the strike was uniformly high. Cuttings made in June were superior to those made in May. The latter were superior to those made in late July. There was no effect from stratification nor hormone treatment.

Chemical Weed Control in Vineyards.—A range of weed-killers was tested for control of weeds in vine rows. Single, spring applications of monuron at 4 lb. and simazin at 5 lb. per sprayed acre gave equally effective control for the entire growing season. They were superior to any other weed-killer tested. No apparent vine damage was caused by monuron nor simazin at rates of 10 lb. per sprayed acre. In another trial, Johnson grass was eradicated from the rows in a 14-acre block of vines by two sprays of dalapon, at 10 lb. per sprayed acre, applied at fourteen day intervals in December.

Grape Storage.—Experiments on the cool storage of table grapes were continued. Polythene case liners gave good results in maintaining berry and stalk quality, while bunch wraps impregnated with sodium-ortho-phenylphenate effectively controlled bunch rots for long periods.

Grape Breeding.—An Chanez x Cornichon hybrid table grape appears superior to most other black varieties in production and storage qualities.

Irrigation Investigations on Wine Grapes.—The effect of timing and frequency of irrigation, on yield and quality of wine grapes and on subsequent wine quality, was investigated.

Table Grape Fruit Quality and Maturity Investigations.—Trials completed in early districts showed that crop level per vine had a strong influence on maturity and quality of fruit. Optimum cropping levels have been determined. Similar investigations on the M.I.A., involving pruning, bunch thinning, and disbudding treatments, gave outstanding improvements in quality. The effect of late pruning of Waltham Cross to reduce the number of small seedless berries was tested. Contrary to experience in other districts, experiments over two seasons on the M.I.A. failed to show any benefit from it.

Nematode Resistant Grape Rootstocks.—Propagations were made, to plant two trials to test the resistance of eight *Phylloxera*-resistant rootstocks for resistance to rootknot nematodes in the Hunter Valley and the M.I.A. Special nematode resistant rootstocks recently imported from California will also be tested when sufficient clonal material becomes available.

Fertiliser Experiments.—Soil and foliar applications of boron, to Black Muscat table grapes, failed to correct the condition known as bunch-stem die-back. This is causing serious economic loss on the Central Tablelands. Fruit and leaf analyses showed that both treatments increased the boron level throughout the vine. Soil application had the greatest and most sustained effect.

Research—Strawberries

Strawberry variety improvement and weed control investigations are centred at Gosford Citrus Experiment Station. Controlled crosses between a number of commercial varieties have been made, and approximately 800 seedlings were planted out for observation and selection.

Extensive, replicated weed control trials were continued.

FRUIT INDUSTRY TRENDS

Tropical Fruit Industry

Banana Production.—Production reached 3,159,000 cases, or 4,212,000 bushels; the highest on record. The bulk of this fruit was produced during the period November to March, and caused low prices. Approximately 1½ million cases were marketed at a loss. Much more fruit was produced in this period, but not put on the market.

Banana Acreage.—There was an increase, by 365 acres; bringing the total to 29,944 acres. Heavy banana plantings of 2,460 acres were made; offset to the extent of 2,090 acres destroyed. In two years time the greater proportion of plantings will be young and vigorous, capable of still higher production. The area now planted to Williams is 23,642 acres. This is 79 per cent. of total plantings. The remainder is mainly Cavendish.

Cultural.—Banana cultural practices continued to improve. Mechanised clearing methods are increasing. Low volume misting for pest and disease control, plastic bunch covers, and increasing use of fertilisers, have all contributed greater production potential.

General.—In anticipation of future production rises, the banana industry has made strong moves in the matter of improved marketing and distribution methods. Special interest has been shown in the smaller case, of one bushel capacity. Trials of this size, in various forms, are under investigation.

Citrus Industry

Production.—Tree condition showed a general improvement, throughout the State. Crop estimates were exceeded, in all districts. Marketing problems created by a large quantity of below average quality fruit, coupled with limitations on export to New Zealand due to fruit fly incidence in the M.I.A. and the Mid-Murray districts, were not overcome. Considerable waste of Valencia oranges occurred, and the marketing season was most protracted. Heat-wave conditions in November and January substantially reduced a promising, spring fruit-set.

Development.—Citrus is being largely planted in new development schemes at Buronga, Boeil Creek, Burnett Cliffs and Paringa on the Lower Murray and also on the Cudgell Sandhills Irrigation Settlement near Narrandera.

Shortage of young trees, of desired bud lines and rootstock association, has continued to retard the rate of plantings on the Lower Murray. Many growers are now raising their own trees to offset the shortage. Valencia oranges continue as the preferred variety in the M.I.A. and Murray River districts, although the balance between Navels and Valentias shows some improvement.

Marketing.—Improved presentation of citrus fruits is receiving increased attention in all major districts. Installation of washing and waxing plants has increased, in packing houses and private growers' sheds. Bulk handling as a means of reducing costs has continued to receive attention, particularly in the south-west. Other centres are also interested, and it would seem that this system, in varied forms, will become

accepted practice for transport from orchard and packing shed. Hawker trading and roadside stalls continue to play a large part in disposing of the orange crop, and are steadily increasing.

General.—Land values, due to subdivision of existing orchards into small, uneconomic units for sale at residential prices, in the vicinity of Gosford and Sydney, have steadily reduced areas available for production. The overall effect is a reduction in citrus plantings in these important coastal districts. Owners of the smaller areas are turning to alternatives with a high ratio of "return to area" such as poultry and vegetable and/or flower growing.

Pome Fruit Industry

Apple and pear crops were heavy, in what should normally have been a light crop year. Early low prices were due in no small measure to a heavy supply of other fruits, mainly bananas. The best part of about half of the N.S.W. crop will be marketed from cool storage to December, 1960. As this fruit is mainly from the Highland districts, the brunt of the low-price period was obviously borne by the smaller, early districts. Several of these also suffered severely from hail and black spot losses.

Production has maintained an upward trend in recent years. During the past season production was estimated at 2 million bushels; whereas, a decade ago, it was an exceptional year when 1½ million cases could be expected. The improvement is attributed to a combination of improved cultural methods, concentration of industry into high production districts, heavy plantings in the late post-war period, and a series of good seasons. Production is expected to maintain its upward trend for some time; taking into account the large acreage of young plantings coming into bearing. Of a total area of 13,500 acres of apples, about 2,700 acres comprise non-bearing trees. Of these, 60 per cent. are in the higher producing areas—Batlow and Orange.

Cool Storage.—Cool storage facilities continue to expand. An increase by 100,000 case space was made at Orange this year. It would appear that a further 100,000 case space will be provided next year. At Batlow, three new cool stores and one new addition to an established store have been built.

The cool storage position in New South Wales at present is as follows:—

Growers	66 stores	360,000 capacity
Co-operative	9 stores	626,000 capacity
Prop. companies ..	33 stores	320,550 capacity
	108 stores	1,316,550 bushels

This storage caters for more than half of the State's production; and there is a continuing upward trend, for more storage space.

Marketing Methods.—Considerable quantities of fruit are being distributed outside of Metropolitan markets. The hawker trade is growing in volume, and it has been authoritatively stated that at least 20 per cent. less fruit is now reaching Sydney markets than was the case five or six years ago. During the past season much of the fruit handled by the hawker trade comprised lower grades, owing to hail blemishes, etc. This would have depressed the Sydney market and been a liability to the grower. There is increasing chain store interest in the fresh fruit trade. Chain stores are engaging in bulk handling methods, direct from the grower to store, and pre-packaging for retail sales.

Fibreboard Cartons.—General adoption of this case is making only slow progress, despite high-pressure sales promotion and considerable financial backing. Main opposition is agents' prejudice. There is little doubt that the case has many desirable features. It is anticipated, despite present opposition, that use of this case will increase from year to year; especially in combination with the recently developed tray pack systems. These obviate skilled hand-packing, and can be carried out by machine.

Bulk Handling.—This season has seen a notable expansion in bulk-handling methods in N.S.W. orchards. Ten of the leading orchardists in the Orange district have adopted the method this season. They report appreciable savings in handling costs. Several installations have been made in the New England, M.I.A. and Oakdale districts also. The system is here to stay and will expand within the next few years. Most cool stores built this year are being designed towards cool storage on a bulk handling basis.

Export Market.—A total of 110,000 cases was exported from New South Wales; a considerable increase on any year since the war. However, this does not indicate a permanent trend. It is, rather, a reflection of low prices ruling on the home market. Fruit was well received on the United Kingdom and European markets and competed successfully with other States and countries.

New Plantings.—Over the past decade there has been a marked trend towards development of five or six of the more favoured districts. Many of the smaller districts, and those marginal by means of soil and climatic disadvantages, are steadily declining.

Stone Fruit Industry

Production.—Seasonal conditions were generally favourable to stone fruits in most of the main producing areas; although coastal and tableland crops were reduced by frosts and variable spring weather. Generally, peaches, plums, apricots, prunes, cherries, and canning peaches were in excess of last year. The prune crop was one of the heaviest on record. Canning peach yields were 50 per cent. higher than in 1959.

Canning Peach Plantings.—There is a swing away from the Phillips variety in favour of Gaume, Stanford, and Boyce; but the standard Golden Queen and Pullars continue in favour. Generally, the trend is for a better spread of varieties.

Apricot Plantings.—Plantings for canning purposes are tapering off from the heavy plantings that followed 1956 losses. Approximately 25 per cent. of all plantings are non-bearing. There is a small expansion of early apricots on the coast.

Prune Plantings.—In the Young district, production has improved as a result of better management and good seasons. New or replacement plantings are negligible. In the M.I.A., fairly heavy plantings of d'Agen variety have been made. Prospects for this variety to supercede Robe are obvious.

Dessert Peach Plantings.—Plantings in most districts continue to expand, and are most apparent in the Bathurst district.

A steady replanting of peaches on old citrus land continues on coastal areas. There is a trend towards increased plantings of more mid-season varieties, with Halvehaven the most popular in all districts.

Cherry Plantings.—Spectacular expansion is taking place in the Young district. This is emphasised by the fact that non-bearing acreage now constitutes 47 per cent. of the total plantings in that district. Production at Young was a record for the district and can be expected to improve. New plantings are also being made in other districts, but scarcity of trees has limited expansion.

General.—Further releases of land for residential purposes in the famous, early peach-growing areas of St. Ives, Eastwood, Carlingford, and Ryde are bringing an era to a close.

In the Murray River areas, there is a growing interest in stone fruits, particularly of early market varieties. Departmental demonstration plots have usefully shown performances of a wide range of varieties under local conditions.

Some growers of cherries in the Young district have claimed higher returns from use of fibreboard cartons as against wooden boxes.

Berry Fruits

A small expansion of plantings in Batlow district has taken place, following successful results in recent years. Batlow appears ideally suited for berry growing. Yields of up to 17,000 lb. per acre have been obtained.

Dried Vine Fruits Industry

Production.—Production of dried vine fruits in New South Wales for 1960 is expected to be about 8,000 tons; compared with 11,770 in 1959 and 11,282 in 1958. Early estimates were for above-average crops. The reduction has been attributed to heatwave conditions in November, 1959. These affected fruit setting. Currants were very light. January rain reduced both quality and quantity of one of the poorest showings of fruit seen in the districts. However, excellent drying conditions were experienced at harvest. Sugar content of the fruit was high.

Markets.—Prices obtained for the 1959 crop at the opening sales abroad were good. Later in the year, competition from elsewhere forced a reduction of up to £20 per ton. Outlook for the current years crop is not so bright, in view of increasing world production of dried vine fruits.

Rack Dehydration.—An efficient dehydration plant has been designed. It is being developed by private industry. However, in view of the good drying seasons experienced in recent years, few growers have taken advantage of the development.

Carton Packs.—Packing of dried fruit in cardboard cartons, instead of wooden cases, is gaining ground. This has followed the success of trial shipments.

Rural Reconstruction Committee's Effect.—Investigation of the Koraleigh and Goodnight areas was continued; and home maintenance units were defined for each district, at 28 and 25 acres respectively. Only seven settlers' properties at Goodnight have been reconstructed; owing to lack of available land. At Koraleigh, progress has been held up by the proposed surface drainage scheme.

Wine and Wine Grapes Industry

Production.—It is estimated that about 20,000 tons of wine grapes were produced; compared with 24,159 tons in 1958-59. Of this total, the M.I.A. produced 18,408 tons; compared with 22,036 in 1958-59. Hail and downy mildew caused havoc in the Hunter Valley and reduced yields by half; while heat-wave conditions in the inland districts during November, 1959, affected fruit setting.

Wine production in New South Wales for the 1959 vintage was 4,732,753 gallons, and it is estimated that 3,891,000 gallons were produced from 1960.

Grape Prices.—Wine grape prices in the M.I.A. were again increased for most varieties by £2 per ton. Also, minimum baumes were fixed. Below them there was no reduction in price with lower sugar contents. Since wineries were taking, for table wines, large quantities of grapes with a low baume test, this meant a considerable increase in returns to growers.

Grape Acreage.—The acreage of wine grapes in the M.I.A. has stabilised. More favourable prices are now being obtained. Thus, an appreciable increase in acreage is likely this planting season.

Interest in Quality Table Wines.—Tremendous interest is being shown, by the industry as a whole, in improving the quality and increasing the quantity of table wines produced in the State. This is evidenced by the installation of special plant in wineries; expansion of plantings in the lower-producing districts, such as the Hunter Valley, and interest in growing poorer yielding, quality varieties.

Table Grapes Production and Marketing

Overall production of table grapes is expected to be considerably lower than last year. In the M.I.A., 144,482 half-bushel cases were marketed; compared with 196,259 in 1958-59, and 271,131 in 1957-8. Exceptionally poor quality of the main variety, Purple Cornichon, was largely responsible for the reduction. Berries were poorly coloured and flaccid, and the bunch stems and pedicels dried out soon after harvest. Two heat-waves in the growing season also caused considerable scalding of berries. Consequently, prices were low, and a large quantity of fruit was diverted to the wineries.

DIVISION OF DAIRYING

Activities of the Division comprised administration of Acts and Regulations, Herd Production Improvement activities, extension and research affecting the dairying industry, and maintenance of dairy products standards.

Generally, seasonal conditions were good in the main dairying areas. Production increased by some 8 per cent., compared with that of 1958-59.

Several floods in the Macleay, Wollongong-Jamberoo and Moruya areas affected production; but better distribution of rain over the latter part of the year helped these districts.

Production during 1959-60 and 1958-59 have been tabulated for comparison:—

	1958-59 gallons	1959-60 gallons
Milk ...	325,000,000 approx.	350,000,000 approx.
Butter ..	84,507,392 lb.	92,677,582 lb.
Cheese ..	11,298,105 lb.	9,740,272 lb.

Regulatory Services

DAIRY INDUSTRY ACT, 1915-55

Advisory Committee.—The Dairy Produce Factories Advisory Committee met on eight occasions, and considered 10 new applications for registration. All applications were approved.

Appeal Board.—The Appeal Board constituted under Section 2, to deal with appeals against decisions of Inspectors under the Act, did not have occasion to meet.

Registration of Factories and Stores.—There were 109 Dairy Produce Factories and 76 Dairy Produce Stores registered under the Dairy Industry Act; as at 30th June, 1960.

Factory plant, buildings, and machinery were kept at a satisfactory standard of construction and hygiene by the co-operation of factory managers, directors, and dairy officers.

Factory Renovations and Extensions.—Plans and specifications were received and approved for the extension of factories and the erection of new factories, as tabulated:—

Factory	New or Extension	Product
Tumut Co-op. Dairy Co. Ltd. ..	Extension	Pasteurised and bottled milk
Dungog Co-op. Butter Factory Ltd.	Complete new organisation of factory.	
Moruya Co-op. Dairy Society Ltd.	Extension	Cheese
Bemboka Co-op. Dairy Society Ltd.	Extension	Milk
T. Glass, Sefton	New	Cheese

A new processing plant, for pasteurising and bottling of milk, and distribution in Canberra, was opened by the Bega Co-op. Creamery Pty. Ltd., to receive and treat milk from the Bega District.

Dairy Science Schools, and Certificates of Competency for Dairy Factory Operatives.—Six Dairy Science Schools were held throughout the State, for tuition and examination of 80 candidates for qualifications under the Act. In addition, many factories were visited by officers to conduct examinations not covered by the schools.

Examination	Certificates Issued
Cheese making	8
Butter making	10
Milk Grading	67
Milk Testing	38
Cream Testing	28
Cream Grading	26

The number of applicants for examinations shows that interest in qualifying for the various certificates has been maintained in the industry. Where special classes were held by dairy officers the results were encouraging.

Butter Manufacture and Grading.—The Butter Grading staff regularly examined butter and cheese manufactured by New South Wales factories and received at Sydney, Newcastle and Wollongong for distribution and storage prior to sale on the local market. Butter manufactured at Casino Co-op. Dairy Company was also examined, at that centre, prior to cold storage.

Resultant information was in each case supplied to factory managers and the district dairy officers to assist in overcoming any quality faults or other manufacturing defects noted at the grading examination.

Considerable quantities of butter were imported into New South Wales from other States during late autumn, winter and early spring to supplement local production. At the request of the selling agents, the quality of this butter was checked by the graders prior to distribution.

Boxes of butter from interstate and intrastate sources examined by the State graders totalled 1,467,869, compared with 1,578,053 in 1958-59, and 4,407 Grade Notes were issued.

The services of officers were availed of as judges and stewards in the Dairy Product Section of the Sydney Royal Show; the North Coast A. & H. Society Show, Lismore; the Newcastle A. & H. Society Show; and the Coff's Harbour A. & H. Society Show; and also for competitions held in conjunction with the N.S.W. Division of the Aust. Dairy Factory Managers and Secretaries Institute.

Analyses of moisture and salt content of butter manufactured at New South Wales factories were done. The results were forwarded to district dairy officers.

A bacteriological survey was done in association with the Biology Branch; on butter manufactured at New South Wales factories and arriving at Sydney, Newcastle, and Wollongong selling floors during the seasonal peak months of November to April inclusive. Several special investigations in regard to butter quality defects were also conducted at a number of factories.

In addition to the aforementioned services, conducted by specialist officers both in Sydney and at country centres, district dairy officers supervised the quality of milk and cream at the site of manufacture into the various products. This enabled close supervision of quality control; and maintained close liaison between the farmer and the factory, and between factory and distributor. This control is reflected in the "Order of Merit" Scheme, conducted by the Department to stimulate interest in quality uplift.

"Order of Merit" (Butter) Certificates.—To be eligible for consideration for an Order of Merit (Butter) Certificate of the New South Wales Department of Agriculture, a factory must submit for grading during a season the undermentioned percentages of its butter manufacture branded as "choicest" quality:—

	Per cent.
March-April	25
Oct.-Dec.	45
Jan.-Feb.	65
Seven months period (overall) covering above months	65

The seven months, from 1st March of one year to 28th February of the following year, are regarded as constituting a season.

To qualify for an Order of Merit Certificate a factory, in addition to complying with the aforementioned requirements, must market, true to "choicest" brand, at least 92 per cent. of its "choicest" branded butter examined by butter graders of this Department and the Commonwealth Department of Primary Industry.

The percentage of butter marketed as "choicest" during the year was 90.8 per cent. compared to 87.1 per cent. in 1958-59; and eleven factories were awarded Merit Certificates.

The comparative figures for the previous four years are:—

1955-56—78 per cent.; 2 certificates issued.
1956-57—83 per cent.; 2 certificates issued.
1957-58—86.8 per cent.; 4 certificates issued.
1958-59—87.1 per cent.; 9 certificates issued.

Cheese Trends.—The trend towards the production of yoghurt, other fermented milks, and continental varieties of cheese, continued. Most of the illegal manufacturers of such types of cheese have been brought under control, but some have eluded detection.

Expansion of production of cheddar cheese has continued; and all factories are now packaging most of their output in transparent films.

Cheese Grading.—Samples representing some 10,000 cheeses were graded on selling floors at Sydney and Newcastle. In addition, arrangements were made for cheese to be graded at the Hunter Valley Dairy Company Ltd., at Hexham, prior to storage for maturation and subsequent packing in consumer portions.

Cheese quality has slightly improved; but flavour defects are still the main cause of downgrading.

Pasteurisation of Milk for Cheese.—Following on the biological examination of certain cheese, and incidence of large numbers of coagulase-positive organisms (*Staphylococcus aureus*), it was necessary to introduce under section 10 of the Dairy Industry Act the compulsory pasteurisation of all milk used for cheese manufacture.

Good liaison was effected with officers of the Biology and Chemistry Branches of Division of Science Services in connection with cheese defects, starter control, cheese composition, etc.

Casein Production.—Machinery for production of hydrochloric acid casein was installed in two factories; and extensive renovations were made to the Cottet's factory at Bomaderry, for manufacture of lactic casein.

Solids-not-Fat Content in Milk.—The research project entitled "S.N.F." was approved during the year. Regular tests are now being conducted at appropriate Departmental Experiment Farms and Colleges where there are herds of registered dairy cattle.

Data will be collected over a period of ten years. The object is to obtain local figures, for examination of reasons for low "S.N.F." content in milk and to advise farmers on how to overcome this defect.

Extraneous Matter in Dairy Products.—Under Export (Dairy Produce) Regulations, filtration of all milk or cream used in the manufacture of export dairy produce is compulsory. Dairy officers have co-operated with the Commonwealth Department of Primary Industry in implementing the installation of such filters. Most factories have now installed satisfactory filters.

Bulk Collection of Milk.—There is a development toward carriage and delivery of milk in bulk to dairy produce factories in this State. This method of collection by road tanker from storage on the farms in refrigerated farm tanks, is not new to Australia. It has already been established in various parts of Victoria, and elsewhere.

Margarine.—Quotas for manufacture of table margarine, to a total of 9,000 tons, were issued to holders of certificates of registration of dairy produce factories for margarine manufacture.

Some 2,882 tons of table margarine were exported to other States. Permits to export table margarine overseas, to a total quantity of 8,750 tons, were issued to firms; a total of 41 tons was actually exported.

Milk and Cream Quality; Factory and Farm Visits.—Officers spent 6,302 hours in dairy produce factories, check-grading milk and cream and the manufacture of other dairy products. Some 417 visits were made in connection with check-grading milk and 539 for cream.

Arising from the factory checks, 3,590 farms were visited. These visits were for advice to the farmers on how to overcome the defects. Seventy-one special investigations were made on farms for milk and cream defects, and 183 special investigations were made in dairy produce factories.

DAIRIES SUPERVISION ACT

Supervision of dairies by Local Government authorities has been in force for the past three years. Inadequate supervision has caused unrest in sections of the industry and some concern to public health authorities.

PURE FOOD ACT

No prosecutions were instituted under this Act.

FACTORIES AND SHOPS ACT

Departmental officers are authorised as inspectors under this Act, to supervise safety measures within the dairy industry. All necessary steps were taken during the year to ensure conformity with the Regulations. This work is done in conjunction with normal duties. It does not necessitate special visits.

Herd Production Improvement Scheme

Herd Recording.—Seventy-six Herd Recorders were employed. They recorded the production of some 56,000 cows under the Group Herd Recording Scheme, and about 8,000 cows under the Official Herd Recording Scheme; totalling 64,000 cows.

Outstanding feature of this year was that twelve new herd recording units became operative. These covered approximately 240 new members and 8,000 cows. The seventy-six Herd Recorders supervised seventy herd recording units in New South Wales and one in the Capital Territory. There are five relief Recorders.

Late in the year, following keen interest by farmers wishing to become members of the Herd Recording Scheme, the establishment of five more units was approved. Further, there was promise of consideration for the establishment of more units in the near future. Consideration is also being given to allowing five extra recording units to be established in areas covered by the New South Wales Milk Board's Artificial Insemination Centre at Berry. In particular, these would record animals conceived through artificial insemination.

Calf Marking Scheme.—Some 6,840 heifer calves were marked under this Scheme. The total of calves marked is now 69,280. Of the total marked, 484 were bred by artificial insemination and 42 were merit calves.

Certified Bull Scheme.—This year, 397 certified bull certificates were issued.

Sire Survey.—Further progress was made this year in sire survey work; and semi-official surveys have been collated and published in *Dairy Topics* for the Ayrshire, Guernsey, Friesian, Australian Illawarra Shorthorn and Jersey breeds. A scientific officer has been appointed to do research on herd recording. An increased rate of progress is therefore anticipated.



Sod-seeded into Pasture; Vetch (Golden Tares) Demonstration, North Coast

Dairy Industry Extension Grant demonstrations have led to increased acreages of Golden Tares in north coast dairying areas. The plant is an important component of "feed-year programme" research at Wollongbar Experiment Farm.

Milking Machine Efficiency Survey.—The survey of milking machine efficiency has continued. Three officers operated for the full year and an additional officer was appointed during the latter quarter. The survey has been very well received by farmers throughout the State. Waiting lists of charts are still held, at all district offices. During the year some 1,250 visits were made to farmers to survey the efficiency of their machines.

Milking Machine Efficiency Certificates.—Milking Machine Efficiency Certificates have been issued to technicians again this year. Some fifty operators now hold provisional certificates entitling them to test milking machines.

Testing Air Flow Meters.—Testing of Ruakura Air Flow Meters at a testing station located at Hawkesbury Agricultural College is functioning satisfactorily. Meters are coming to hand for testing.

Extension Services

Dairy Science Schools.—Six Dairy Science Schools were conducted for tuition and examination of factory operatives for certificates of competency in milk and cream testing and cream grading. Eighty operatives attended the schools.

School of Instruction for Factory Operatives.—A School of Instruction for factory operatives was conducted at Lismore by dairy officers of the Lismore Dairying District. The course was arranged by Department of Technical Education. Subjects included theory and practice of milk and cream testing, and milk and cream grading. Thirty-seven operatives attended these lectures.

Talks by Dairy Officers.—Talks were given by dairy officers at Dairy Farmer Refresher Courses, fields days, film evenings, Agricultural Bureau meetings, Junior Farmer Club meetings and other rural gatherings during the year.

Dairy Farm Improvement Competition.—One hundred and forty entries were received for this competition. District judging was conducted by district dairy officers. The winners in each district were then judged by specialist officers from head office. This competition is sponsored by the Country Life Newspaper.

General Extension Service, Statistics of Farm Visits.—Some 4,000 farms were visited by dairy officers in the general course of extension work. In addition, 765 visits were made in connection with Dairy Industry Extension Grant demonstrations, and 918 visits were made for herd improvement advice.

Dairy officers travelled 164,000 miles by car in the course of the year's work.

General Extension Service, Statistics of Group Activities.—Dairy officers attended 85 field days, 90 film evenings, 56 meetings of Agricultural Bureau branches, and 42 Agricultural Shows, for extension purposes. At the Sydney Royal Show, officers acted as Judges and Stewards in the Dairy Cattle and Dairy Produce Sections.

Dairy Industry Extension Grant.—The 1959-60 allocation to New South Wales under the Commonwealth Dairy Industry Extension Grant was £64,880. This was for promotion of improved practices in the dairy industry. It was expended on: Grade Herd Recording; farm demonstrations of improved pastures and silage making; milking machine efficiency survey; testing station (air flow meters); punch-card equipment for Herd Recording; publicity; agricultural trainees; salaries of organising officers and salaries of staff engaged in statistical work.

Farm Demonstrations.—At the outset of 1959-60 there were 215 demonstrations on farms. During the year 152 were terminated, and 120 were established. Thus, at 30th June, 1960, there were 183 in hand.

Publicity.—The circulation of *Dairy Topics*, a bi-monthly periodical, to all dairy farmers in the State has proved very popular. Publicity was also covered by press articles in local papers, articles on the Department's weekly *Press Copy* and monthly *Agricultural Gazette of N.S.W.*, and in regular farm radio sessions on country stations.

Government Herds

Competitive Exhibits.—Representative dairy cattle exhibits from five Government Experiment Farms and Colleges, comprising Jerseys, Guernseys, Friesians, Australian Illawarra Shorthorns and Ayrshires, 58 head in all, were exhibited at the 1960 Sydney Royal Show. They competed successfully. Prize money totalling £273 15s. 0d. was won. The teams secured 16 First Prizes, 7 Second Prizes and 8 Third Prizes.

Interstate Stock Purchased.—The Principal Dairy Officer (Herd Improvement) visited Victorian Stud Guernsey and Jersey breeders in the Murray Valley, to obtain high-class Jersey and Guernsey heifers for Government Studs at Wagga and Yanco. Three Jersey heifers and one Guernsey heifer were purchased.

Miscellaneous

Commonwealth Committee of Enquiry into the Dairying Industry.—For this Committee, set up by the Commonwealth Government considerable information supported by graphs, maps, tables, etc., was collated by this Division, with the co-operation of Animal Industry, Plant Industry, and Marketing and Agricultural Economics Divisions. Arrangements also were made for the Committee to meet dairy officers in various country centres. The Chief of the Division of Dairying, and officers of other Divisions, gave information to the Committee at a Sydney hearing; later he accompanied the Under Secretary to Melbourne, at the Committee's invitation, to confer further with the Committee.

Overseas Study by Dairy Research Officer.—Mr. G. J. Smith is still overseas, at the University of California, continuing post-graduate studies.

Appointment of Livestock Research Officer (Dairy Cattle).—Mr. C. Gray, formerly of the Biometrician's Branch, took up duty in the newly-created position of Livestock Research Officer (Dairy Cattle). Stationed at head office, he will conduct research into data relative to herd recording.

Jersey Cattle for Australian Experimental Dairy Farm, Ben Cat, Vietnam.—Mr. P. H. Teague, Livestock Officer (Dairy Cattle) was in charge of a consignment of Jersey cattle from N.S.W. to South Vietnam. This supply of stock for the Australian Experimental Dairy Farm at Ben Cat was arranged under the Colombo Plan.

DIVISION OF ANIMAL INDUSTRY

Veterinary Staff

Three large western district veterinary officer areas were reorganised. They were divided roughly into two, and three new district veterinary officer positions were created. It was necessary to draw on the veterinary inspector staff to provide two of the new district veterinary officers. The incremental range of veterinary officers provided the other one.

A new position of Assistant Principal Veterinary Officer (Disease Control) was filled also from the incremental range of veterinary officers.

Mr. J. C. Keast, former Principal Veterinary Research Officer, was appointed Director of Veterinary Research, vacated by Mr. Grahame Edgar, Assistant Under Secretary.

The veterinary services in this State, i.e. Departmental veterinary officers and the veterinary inspectors, are at approximately two-thirds strength. Meanwhile, there is continual pressure of more duties and responsibilities. In that light the staff position continues to decline. The position is critical.

Some Interesting Developments

Some notable occurrences were detection of muscular dystrophy in sheep, in several areas; introduction of compulsory pulorum testing in poultry; detection of goitre in sheep, as a cause of neonatal mortality; suspected outbreaks of infectious rhinitis, bovine rhino-tracheitis, and sporadic bovine encephalo-mylitis; and establishment of the footrot and the T.B. eradication schemes.

Muscular Dystrophy.—This disease appeared on properties in a wide area of the northern tablelands; also in a few isolated areas of the southern tablelands, and in the Riverina.

Two different syndromes were observed. Where seen on the properties, the disease was characterised by lameness, progressing to paralysis. Death followed in up to 30 per cent. of cases. In the Riverina, however, the disease was detected at an abattoir. There the meat inspectors condemned most of some consignments of lambs for human consumption.

In view of the New Zealand work, treatment with selenium was tried. The results so far are somewhat mixed. Trials have been planned for next year to determine the effect and if selenium is successful, the best method of applying it.

Pullorum Disease.—The compulsory, pullorum-testing flock scheme came into operation this year. Regulations under the Stock Diseases Act, 1923-1934, require that any person who sells any chickens or hatching eggs must derive the eggs from tested birds. If the test reveals that the parent stock have less than two per cent. of reactors, annual tests are required; but if more than two per cent. of reactors are obtained, there must be monthly tests until the percentage of reactors falls below two per cent.

The majority of breeders and hatcherymen have complied well with the new regulations. A few breeders appear to have disregarded the regulation. Action is in hand to bring them under control.

Goitre in Relation to Neonatal Mortality.—A useful survey of neonatal mortality was undertaken by the Goulburn district veterinary officer at the spring lambing. One of the conditions responsible for neonatal mortality was goitre. It is the first time goitre has appeared to be so extensive a factor in sheep neonatal mortalities.

The condition was studied only on four properties, but mortality due to goitre was in each case quite extensive. Enlargement of the thyroid gland was marked. Some measured 2 in. x 1 in. and extended half way down the neck. They weighed 22 grammes, as against the normal range of 0.5 to 1.7. Other findings included anaemia, brittle bones, and sometimes a sparse or hairy coat. The mortality occurred in these lambs either just before birth or up to three days afterwards.

Infectious Rhinitis.—Close attention was paid to pigs at the Sydney Royal Show. Some sneezing occurred there in the pig shed, but was attributed to the bedding. Subsequently, a mild suspected outbreak at Hawkesbury Agricultural College was investigated; but had not been confirmed when the year under report closed at 30th June, 1960. There was no direct connection between pigs at Hawkesbury Agricultural College and the Royal Show pigs, but some indirect contact through personnel had occurred.

Another highly suspicious although unconfirmed outbreak was investigated in the Port Macquarie district. There, three litters were affected during September, 1959. Mortality in the litters approached 50 per cent. Two live pigs examined by the Director of Veterinary Research revealed purulent mucoid material in the ethmoid turbinate region. It could not be demonstrated that the disease was infectious rhinitis. Some doubt was cast on the diagnosis, because of favourable response to penicillin therapy. There was no further involvement of the holding during the year, despite numerous inspections.

Suspected Bovine Rhino-tracheitis.—A condition, resembling this disease as described in America, occurred on at least two properties near Denman. There was a drop in milk production, and, in some cases, a rise in temperature. There was an ocular discharge, and a nasal discharge which was sometimes blood stained. The animals showed irritation in the nasal cavity. They rubbed the inside of the nostrils on sticks and dry plants in an effort to obtain relief. Cases recovered after a few weeks. There were no deaths.

The condition was first noticed in autumn. It disappeared in the winter. Nasal granuloma was at first suspected, but it was certainly not the disease responsible for these symptoms. So far, no further case has been observed.

Sporadic Bovine Encephalomyelitis.—For many years, a condition somewhat like ephemeral fever has occurred in the Tamworth district. It has been known as ephemeral fever-like disease. This year the disease was transmitted for the first time, from material from a natural outbreak. Also, some spread occurred on other properties; or, at least, the condition was recognised on other properties.

In Tamworth district it causes fever, lameness, swollen joints, ataxia, peritonitis and pleurisy, and prostration and death in varying periods from several days up to four weeks. Recovery occurs, but only slowly. Morbidity varies up to about 40 per cent., and mortality up to 10 per cent. of the mob. The deaths and severe loss of condition make it a disease of considerable economic importance on individual properties.

A condition very similar to that at Tamworth district was identified and investigated at Orange in April, 1959. It is interesting that the owner introduced a draft of heifers which had been bred at Barraba in the Tamworth district. They had gone to Orange, via Dunedoo in August, 1959, and calving commenced in September. Three calves were affected, the first in February, the second in April, and the third in May.

Two died, and the third was killed in extremis. The symptoms were very similar to those described in the Tamworth outbreak; but there was some hypersensitivity, and seizures resembling rye grass staggers.

On post mortem examination, there was a fibrinous pleurisy and peritonitis, but no involvement of the joints. There was slight inflammation in the small and large intestines. Cerebro-spinal fluid was increased. Meningeal vessels were engorged. The Director of Veterinary Research commented that the histopathology of brain tissue forwarded was typical of sporadic bovine encephalomyelitis.

Points of special interest are the similarity between the two conditions, the connection between the Tamworth district and Orange, the observations of the Director of Veterinary Research on the histopathology, and the fact that the disease was transmitted from material from a Tamworth outbreak.

Special observations and investigations in the Tamworth district have been planned, to finalise the diagnosis.

Outbreaks of Trichomoniasis.—Outbreaks were extensive in the territory of the Grafton district veterinary officer. In this area control is handicapped because continuous artificial insemination services are not available. At 30th June, 1960, there were thirty properties in quarantine for this disease in that area; about twice as many as in all the other districts combined.

To increase the efficiency of control in the area, two cattle inspectors are to be trained in the technique of artificial insemination of cattle.

Ovine Brucellosis.—This received considerable attention. Further observations were made on a Narrandera property where the disease has been brought under control by a combination of vaccination and segregation of young rams. The observations indicate that a policy of segregation alone will be effective in some cases, but, for rapid eradication, controlled vaccination of young rams may be needed.

The Narrandera observations have shown an occasional carryover of infection between the dam and the lamb; and this could slow down control.

Coccidiosis, and Nematodirus Infestations in Sheep.—During the autumn, coccidiosis either alone or in combination with nematodirus infestations played havoc with spring lambs born in the previous year. As the winter progressed, infestation was also noted in autumn lambs. Probably the coccidia were the main pathogens; as symptoms and mortality were brought under control by two or three drenches with sulphadimidine.

Regarding nematodirus the position is not so clear. There were several reports of bephenium bringing nematodirus infestations under control; but these observations may not be accurate, as the nematodirus life cycle is not straight forward. It is probable that if phenothiazine had been used at that particular time, control would have been established.

Stephanurus dentatus Infestation in Pigs.—In pigs slaughtered at the Merimbula Bacon Factory this infestation was common. It is concluded that the entire coast of New South Wales is now infested with this parasite. This will have repercussions on export of pigs to New Zealand. That country demands freedom from this parasite as a condition of entry.

Phenothiazine Toxicity in relation to Particle Size.—There were disturbing reports of toxicity in sheep due to a new "pure" superfine particle-size phenothiazine. It was logical to suspect this; as the history showed mortality to have occurred within a few days of drenching, and that the size of the sheep in each age group varied within wide limits.

Recommendations have been to drench according to age groups, but consideration has now to be given to the formulation of a range of doses—based on body weight rather than age.

Infectious Bovine Diarrhoea.—This occurred on the north coast in a few herds early in summer, and in the autumn. The significant point is that these outbreaks appeared in the warmer months. Some outbreaks were in herds not affected previously, and some were in herds without recent contact with cattle of unknown disease status. Individual cases of scouring were numerous, with symptoms similar to those in the outbreak in the previous year. It seemed that the disease has now settled down into a chronic phase.

Infertility in Coastal Cattle.—This is still a major problem.

Vibriosis is a known cause of the infertility, but good control has now been achieved following development of a treatment by the Grafton district veterinary officer. This involves infusion of the vagina with a watery solution of half a gramme of streptomycin, an hour or two before service. It greatly improves the breeding rate in herds that have an acute infective syndrome.

Footrot of Sheep; Eradication Scheme.—In the northern part of the State footrot infection in sheep occurs only lightly. Considerable extension activity has occurred there in an attempt to limit it.

An advance has been made by introducing, under the Stock Diseases Act, regulations relating to control of footrot and notification of the Armidale Quarantine Area.

The regulations enable an inspector to direct an owner of infected sheep to take appropriate steps to bring the infection under control; and to prevent its spread to clean stock by maintaining the property in what amounts to quarantine.

The Pastures Protection Board was empowered to employ an additional ranger, and to purchase certain equipment so that the ranger and the veterinary inspector could demonstrate proper methods of paring and treatment of infected sheep. Progress of this eradication programme is of great interest to other comparatively free areas within that district. It is also being watched closely by organisations in the more heavily infected parts of the State. The scheme has just commenced. No firm information will be available as to its success or otherwise until next year.

Tuberculosis; Illawarra Quarantine Area Established.—A progressive step towards the full control of tuberculosis in cattle was taken, by declaration of the Illawarra Quarantine Area on account of tuberculosis.

The Illawarra Quarantine Area embraces the near south coast and Illawarra district, stretching to the mountain ranges. Its southern extremity is just south of Jervis Bay.

Regulations were brought down enabling an inspector to direct owners to have their cattle tested for tuberculosis within the time specified in the order. This will help the district veterinary officer to regulate the testing, and thus keep control of the amount of retesting needed when infection is discovered.

Testing is initially done by practitioners at the owner's expense; but any retests needed in eradicating the disease from a herd are done by Departmental veterinary officers or inspectors. Testing has progressed smoothly in the area. At the close of the year about 10,500 cattle had been tested. Most were for the first time, but some were retests.

Some 394 positive reactors were detected, indicating an initial incidence of 3.77 per cent.

In herds tested for the first time, the incidence was higher. At the close of the year, 101 herds had been dealt with, involving 7,494 cattle; therein 365 positive reactors were found, an incidence of 4.87 per cent.

Further Quarantine Areas are contemplated; in the Tweed-Lismore and Casino districts, and in the Grafton, Port Macquarie, Gloucester, Maitland, Braidwood and Eden Pastures Protection Districts.

Veterinary Research Station, Glenfield

VETERINARY DIAGNOSTIC SERVICES

At the Veterinary Research Station, Glenfield, 29,419 specimens were examined; by comparison with 27,019 in 1958-59 and 33,774 in 1957-58. Cattle specimens 3,894; pig specimens 1,460; horse specimens 130; miscellaneous bird and animal specimens 319; miscellaneous other specimens 254. Entries in the Specimen Register totalled 5,092. Inspections under the Noxious Microbes Act totalled twelve.

TOXICOLOGY

The various specimens, submitted from 211 sources, involved 522 chemical analyses. Some details are given:—

Arsenic Poisoning.—Forty-seven mortalities were investigated with positive results, and 108 with negative results. In all 314 analyses were made for arsenic. Stock losses due to arsenic poisoning comprised 29 head of sheep in four mortalities; 255 head of cattle in 36 mortalities; and 40 head of pigs in one mortality.

132 head of cattle, on three properties, were poisoned by lead arsenate used by mistake for hexachlorethane. A specimen of dead prickly pear was found to be toxic eighteen months after it had been sprayed with arsenic.

Lead Poisoning.—Fourteen mortalities were investigated with positive results, and fifty-five with negative results. In all, there were ninety-six analyses for lead. The mortalities caused loss of twenty-one head of cattle.

Oxalic Acid Poisoning.—Six mortalities were investigated with positive results. In all, there were twenty analyses for oxalic acid.

Strychnine.—Three cases were investigated, with positive results in each case.

Miscellaneous Analyses.—There were 119 miscellaneous analyses. These included a case where pigs died after eating apricot kernels boiled during a jam making process. HCN was found in the ingesta and in the kernels.

Urinary calculi from sheep were examined, from eight sources. They were composed mainly of calcium and magnesium carbonates. In one case, however, wherein five calculi were submitted, each contained a central core of silica surrounded by carbonates.

RABBIT MYXOMATOSIS

There has been a marked reduction in demand for myxomatosis virus for rabbit control during the twelve months; from both graziers and rabbit control authorities. This is probably due to general low incidence of rabbit numbers; less satisfactory results of virus release generally than in previous years, because of low rabbit density and the field development of strains of lowered virulence and rabbit control authorities' emphasis on and demonstration of the value of the poison Sodium fluoroacetate ("1080").

The reduced demand for myxomatosis virus is well illustrated in the following table. It shows virus release figures since supplies from Glenfield were commenced in 1951:—

Year	Rabbit Doses	Ampoules of Virus	No. of Requests
1959-60	39,000	1,560	181
1958-59	126,625	4,997	653
1957-58	152,425	6,097	661
1956-57	200,200	7,763	742
1955-56	194,200	3,884	542
1954-55	280,850	5,617	673
1953-54	296,900	4,514	558
1952-53	279,200	3,389	.....
1951-52	249,600	.....	.....
1951 Feb. to June	21,600	.....	.....

ARTIFICIAL INSEMINATION OF CATTLE

Training of Inseminators.—Under the Stock (Artificial Insemination) Act, prospective candidates for inseminator certificates must undergo a course of instruction at Glenfield Veterinary Research Station, followed by further practical training at an insemination centre.

During the year, twelve such candidates received such training. They comprised three New South Wales Milk Board employees; four from independent organizations that are supplied with semen by Milk Board Centres; and five trainees intended for beef cattle breeding. The latter group are intended for work in Queensland, Northern Territory and New South Wales.

Testing of Bulls for Breeding Centres.—Health and fertility tests for bulls on offer to the New South Wales Milk Board, Departmental transfer bulls, and bulls from private breeders with specific problems, are carried out at Glenfield. During the year, twenty-seven bulls were examined and test mated. Of these, seventeen bulls (comprising seven Jerseys, six A.I.S., three Friesian and one Ayrshire) were examined on behalf of the Milk Board. The remainder comprised seven privately owned animals and three Departmental bulls. Two of the seven were Aberdeen Angus bulls; handled in co-operation with the C.S.I.R.O. and the University of Sydney in connection with an artificial breeding project in North Borneo.

In addition to the foregoing, some privately owned and Departmental bulls were examined for fertility in the field. These included two Santa Gertrudis bulls intended for cross breeding work, by artificial insemination, in New South Wales.

VETERINARY RESEARCH—CATTLE

Eperythrozoonosis in Cattle.—For the first time in New South Wales *Eperythrozoon wenyon* was recognised in cattle. It was observed in the blood of a splenectomised calf following inoculation for diagnosis of tick fever. The parasite is commonly observed under similar circumstances in Queensland.

Infectious Bovine Diarrhoea.—This disease was not considerable this year but reports of its suspected presence in an enzootic or subclinical form have been received. One case was investigated where a small herd, unaffected during the epizootic in the preceding year, was affected by the acute form typical of epizootic conditions.

Ephemeral Fever Like Disease in Calves.—Further cases have been confirmed by transmission in calves, all with specimens from Tamworth district. Efforts to establish the infection in laboratory animals, in particular rabbits, both normal and cortisone treated, have been unsuccessful. More extensive experimental work will require the use of a large number of calves, with adequate quarantine facilities.

A field survey has been planned, to define the disease more accurately and to estimate its economic importance. This may give a basis and justification for the type of investigation that would be needed to advance our knowledge of the aetiology and pathology of the disease. At present, the cases confirmed or suspected from specimens submitted have almost invariably occurred along the river system lying west of a north-south range of mountains about ten miles west of Tamworth.

Similarity between this disease and sporadic bovine encephalomyelitis has been noted recently. This indicates a direction for further investigation.

Sporadic Bovine Encephalomyelitis.—As mentioned already, this disease may be related to or identical with the condition described as ephemeral fever like disease of calves. In a case of the latter in the Bathurst district, clinical and gross and histopathological features appeared identical with sporadic bovine encephalomyelitis.

Mastitis in Cattle.—Examination of routine milk samples revealed that Staphylococci are still the most common cause. Many of these show resistance to penicillin but most are sensitive to streptomycin. In co-operation with Division of Dairying, a mastitis survey is proceeding. It is designed to study the influence of milking machine efficiency on the incidence of mastitis.

Milk Fever in Cattle—Prevention with Vitamin D3.—A high incidence of milk fever in a herd owned by the Department provided the chance to assess the value of Vitamin D3 as a preventive. A trial involving parenteral administration of 10 million units of Vitamin D3 to cows within eight days of calving was commenced. It is as yet too early to assess the value of the treatment.

Sorghum alum—Studies on Toxicity.—Trials on perennial sorghum (*Sorghum alum*) continued during the 1959-60 season. The effect of urea fertiliser at the rates from nil to 1 cwt. per acre was examined, for influence on the HCN level of the sorghum. Seasonal conditions handicapped the project, but even so it was found that urea increases the HCN content. The highest level of HCN obtained was 0.030 per cent., but in general, levels were lower than in the previous year.

Trials with cattle involved prior starvation and withholding water for 36 hours, and strip grazing. In no instance was any sign of toxicity demonstrated in the cattle.

Hypomagnesaemia in Cattle.—Trials at Kangaloon on the effect of dolomite applications to pastures have been discontinued. No seasonal deficiency in the herbage was demonstrated.

Digestibility Studies on Kikuyu Grass.—At Wollongbar Experiment Farm, mid-season kikuyu grass (*Pennisetum clandestinum*) was submitted to a digestibility trial with sheep. The fibre content was found to be 34.9 per cent. and the digestibility coefficient of dry matter, crude protein and fibre was 57, 60 and 67 respectively.

Bovine Trichomoniasis.—Observations on the growth requirements of *T. foetus* were continued. The aim is a simple medium suitable for optimum growth. Ordinary broth was found to give more rapid growth than 0.1 per cent. agar, with similar retention of characteristic shape of the organism. Serum broth, sterile skim milk, and the influence of small amounts of soap in the media, were also investigated. Preliminary work suggests that controlled temperatures are a satisfactory solution to the problem of mould growth in stock cultures. The value of glycerol in varying percentages in the media is being examined, with a view to using it to control trichomonas infection in infected semen.

Methods to improve the diagnostic techniques for suspected infected bulls are being studied. No one method yet appears entirely satisfactory.

Some commercial preparations of value against *T. vaginalis* in humans are being tested for value in treatment of infected animals. Results as yet are not promising.

Vibrio fetus.—Over 2,000 vaginal mucus samples were examined. Some 1,257 samples from 188 separate problem herds were submitted to the vaginal mucus agglutination test. Positive VMA reactions were obtained from more than 50 per cent. of these herds.

Tests were usually conducted with antigen made from strain 1980, but other antigens prepared with Longsdon and two Glenfield strains were used on a comparative basis with many of the mucus samples. Preparation of quantities of vibrio antigens presents no difficulties with the simplified method developed at Glenfield.

Values of the catalase and Hydrogen sulphide production tests in evaluating pathogenicity of *Vibrio* strains are being studied. Present indications are that these criteria may not be totally adequate.

A simple, flagella staining technique has been developed. It has proved useful in a number of ways. These include the examination of contaminated smears, for checking the presence of flagella in antigenic material and assisting the identification and classification of *V. fetus* variants.

Methods to overcome difficulties met in the primary isolation of *V. fetus* from contaminated material are being investigated. Results are promising.

In spite of limitations, the VMA test remains the most useful laboratory diagnostic aid for this disease.

Observations have not yet revealed evidence of agglutination of *V. fetus* antigen by *Brucella* or *Trichomonas* antibodies. A possible exception is in one herd in the Casino district. There, concurrent infections with *Vibrio* and *Brucella* were present. However, work along these lines is continuing with trichomonad infected females at the Glenfield Veterinary Research Station.

VETERINARY RESEARCH—SHEEP

Ovine Brucellosis.—3,811 individual complement fixation tests were done. The complement fixation test in use at the beginning of the year was unsatisfactory in regard to sensitivity and consistency. Investigations aimed at improving these features were attended by some success. The test now in use appears satisfactory in both respects; but it is still desirable to establish with more certainty the proper interpretation of various titres of reaction.

In regard to sensitivity, considerable improvement attended the replacement of physiological saline by a complex barbiturate buffered solution. Apart from higher titres obtained in comparative tests, some indication of the increased sensitivity is given by the increase from approximately 40 per cent. to approximately 80 per cent. in reactors amongst clinically-affected rams of British breeds.

Sensitivity of the complement fixation test was stabilised within fairly narrow limits, following recognition of a differential deterioration of complement in regard to sheep cell-indicator system and the *Brucella ovis* antigen-antibody system.

Steps have been taken to obtain equipment and to develop complement preserving techniques which should streamline testing procedures. Thus, greater numbers may be tested at various dilutions and labour further reduced.

Records of breed and clinical status of animals tested have been kept. A preliminary summary has been prepared, covering about three months of testing under conditions comparable to the current test. Some figures of interest have been obtained:—

1. Approximately 80 per cent. reactors amongst rams of British breeds showing clinical epididymitis; compared with 25 per cent. amongst similar Merino rams.

2. Most of the Merino rams were known to be in contact with other breeds, and the figure for Merino animals not in such contact is probably well below 25 per cent.

3. In the case of Dorset Horns and Border Leicesters, which accounted for the majority of British breeds tested, 24 per cent. of serologically positive animals showed no palpable abnormality. This figure is within the 20 to 30 per cent. suggested as a proportion of infected animals failing to develop palpable lesions. As vaccination is not widely practiced it is unlikely to account for many of this group.

4. Within the Dorset Horns and Border Leicesters, 20 per cent. of all clinical cases of epididymitis failed to react serologically, and 30 per cent. of all serologically negative animals showed some palpable abnormality.

It is probable that these proportions are not necessarily false negative serological reactions, but are due to:—

- (a) non-specific epididymitis;
- (b) lesions remaining after natural recovery;
- (c) inaccurate clinical assessment.

The route of infection trial commenced in the preceding year has been concluded. Results are summarised in the following table:—

Route of Challenge	Number of Rams	Infected	Not Infected		
			Transient	CF titre	No. CF titre
Intratesticular	4	4	..	1	1
Intravenous	4	2	..	1	1
Intra-preputial	4	1	..	1	1
Oral	4	..	..	1	4
Control	5	..	..	1	5

It is of interest that the experimental animals were young Merino rams and, although members of each group were housed together, no secondary transfer of infection within groups was noted. All titres, persistent and transient, developed promptly after challenge.

Other points of interest were:—

1. C.F. titres developed several weeks before infection was demonstrated by clinical or bacteriological means.
2. Infection was detected bacteriologically (either by direct smear examination or by culture) in only 55 per cent. of single semen samples from infected animals. This figure might be increased if presence of inflammatory cells were accepted as evidence of infection, possibly an acceptable criterion in a flock known to harbour infection.

The initial phase (covering two years) of investigations in a Dorset Horn flock where low lambing percentages were associated with a high incidence of *Br. ovis* infections in rams, was concluded. During this period, a high degree of control was obtained by a programme that combined segregation at weaning and vaccination at five to ten months; and, at the same time, lambing percentages greatly improved.

On this property the complement fixation titres following vaccination have persisted in about 50 per cent. of animals for six to nine months, and can persist for at least twenty-one months. The longer persistence could have been due to contact with unrecognised infected animals.

On the same property (although control by the two measures has been largely effective, and, in general, it is currently believed that segregation alone should be effective), there have been several instances of rams, five to ten months of age, segregated since weaning, showing serological titres. This suggests occasional individual breakdown in control by segregation alone. Unfortunately, it has not been possible to obtain further serological evidence of possible active infection in these individuals. The practice is to vaccinate all at the time of the first bleeding. Further investigation may involve examination of the ewe flock.

Information from other flocks also suggests that the role of the ewe in maintaining the disease in a flock requires further investigation. One ewe flock, mated to an infected ram in three groups, showed 65 per cent. reactors in a group not yet lambed, and still in contact with the ram; and approximately 20 per cent. reactors in two groups lambed approximately four and ten weeks, and out of contact with the ram since shortly before lambing.

Muscular Dystrophy in Lambs.—This has been observed in lambs two weeks to three months old, on over twenty properties in the Armidale and Glen Innes Pastures Protection Districts; also on a Goulburn property and another at Cooma. It has been confirmed for the majority of these properties by biochemical and histopathological examination.

Outbreaks occurred in spring and early summer. From 1 per cent. to 20 per cent. of lambs were affected in the various flocks. Most of the affected lambs died.

Laboratory observations confirmed the value of the estimation of Glutamate oxalacetate transaminase (G.O.T.) as a diagnostic aid. This enzyme is liberated into the serum from damaged cells; and thus is also present, in excessive amounts, in animals with liver damage. However, determination of serum bilirubin will assist in the interpretation of G.O.T. values.

Aetiology of the disease as it occurs in the U.S.A. and New Zealand has not yet been clarified. However, Vitamin E and/or selenium therapy have given promising results. Treatment trials have been planned for the approaching lambing on northern tableland properties.

A somewhat similar condition was responsible for heavy carcase condemnations at the Wagga abattoirs in the summer. These lambs were four to eight months old. They showed no clinical signs of the disease, but extensive lesions were present at autopsy.

Neonatal Losses in Lambs—Goitre.—During a survey of neonatal lamb losses done by the Goulburn district veterinary officer and officers of the Glenfield Veterinary Research Station, in August, 1959, severe goitre was found in a large number of lambs from two properties in the Crookwell area associated with a 30 per cent. lamb mortality. Observations were made on thyroid iodine concentration, osseous maturity, and body weight. There were very low concentrations of iodine in the thyroids, and osseous maturity was markedly retarded.

Experiments are now being conducted to assess the effect of various treatments, and to see whether a simple iodine deficiency or the presence of a goitrogen is responsible.

A survey of the incidence of goitre in New South Wales is proceeding. Further new born lambs from other areas of New South Wales will be examined this year for goitre.

Carbon Tetrachloride Poisoning in Sheep.—Work on CC14 poisoning in sheep continued. In particular it is concerned with material submitted from field cases; in an attempt to see how closely the biochemical pathology of the field condition resembles that of the poisoning of sheep in the laboratory. The dose necessary to kill sheep under laboratory conditions is about fifty times that which is used in the field—usually with no ill effects but capable of causing severe losses.

In field cases, the function of the kidney is markedly affected whereas liver function is only slightly affected. In animals poisoned in the laboratory both liver and kidney function are markedly affected.

Nitrate Poisoning Trial.—An experiment wherein pregnant ewes are being drenched twice daily with potassium nitrate has commenced. It is firstly, to see whether chronic ingestion of nitrate has any outward effects on the sheep or their lambs; and secondly, to see whether nitrate, known to be slightly goitrogenic in rats, has a similar effect in sheep.

Eperythrozoonosis in Sheep.—This recurred on the property where it was first recognised in the preceding year. This time there was no mortality; possibly due to a higher plane of nutrition.

Anthelmintic Trials with Sheep.—Laboratory and field trials were undertaken to determine the anthelmintic efficiency of certain preparations:—

- (1) *Clay*—an inert clay slate containing much kaolin had been claimed to be an efficient anthelmintic by a number of graziers in the Goulburn District. However, trials revealed that even with continued dosage this clay has no anthelmintic properties against *Haemonchus* or *Trichostrongylus*.
- (2) *Dithizine Iodide*—inconclusive results were obtained with this preparation against *Haemonchus*, *Nematodirus* and *Strongyloides* infestation in lambs. Further trials are warranted.
- (3) *Montrel (Dowco 132)*—trials showed this preparation to be efficient against *Haemonchus*, particularly when delivered into the abomasum. However, results against *Trichostrongylus* were disappointing at dose rates as high as 200 mg./Kg. body weight. Above that level, this organic phosphate is reported as being toxic to sheep.
- (4) *Asuntol (Bayer 21/199)*—good results were obtained against *Haemonchus*, but only fair anthelmintic efficiency was shown against *Trichostrongylus*. Trials using higher doses are needed.
- (5) *Quinazine Toluene Sulphonate*—the first field trial has just been completed but results are not yet available.

Coccidiosis in Sheep.—Odd outbreaks of coccidiosis in young sheep have been reported occasionally for some years. During the autumn and winter of 1960 the incidence markedly increased, particularly in tableland districts. A good response to the use of sulphamezathine in affected flocks has been reported from some properties; but further work on this disease is needed, to determine the reasons for sudden increase in incidence and what preventive measures may be taken to prevent recurrence of the condition.

Itch Mite Investigations.—Owing to resignations within the Entomology Branch, Division of Science Services, all work on sheep itch mite has been transferred back to Division of Animal Industry. Several preparations for control of the parasite (*Psorergates ovis*) have been screened. Those showing promise will be included in larger trials. The value of various concentrations of arsenic will also be determined.

SHEEP DROUGHT FEEDING RESEARCH

This work is in association with the C.S.I.R.O.

Utilization of Low Quality Roughage

Urea Fed in Pellet Form.—Previous studies at the Burdekin Unit showed the merits of adding urea to a low quality roughage, increasing the nitrogen content. However, rate of consumption must be controlled somewhat to overcome urea toxicity.

An experiment was commenced in August, 1959, to observe and compare the effects of pelleting wheat plus urea. In addition to a control, fed low quality roughage (2.1 per cent. crude protein), pelleted wheat plus urea was compared to unpelleted. Both were fed on a twice-weekly and a daily basis. The pens consisted of sixteen sheep. The wheat, urea proportions were 4½ oz. of wheat + 6 grams of urea and 2½ oz. of wheat + 6 grams of urea. Unfortunately the trial ended at the ninth week, because of suspected phenothiazine toxicity.

The low protein content of the roughage affected palatability, sufficiently to reduce daily consumption to under half a pound. A lot of the sheep fell away in condition quickly, and, when drenching was carried out with 1½ fluid oz. of fine particle phenothiazine, over twenty-five deaths occurred. A combination of poor intake, decline of body reserves, and the dose rate of the fine particle size phenothiazine, was suspected as cause of the deaths.

At the end of the ninth week there was no significant difference between groups fed pelleted and non-pelleted rations, in terms of survivors or body weight.

Addition of lucerne.—In March, 1960, a trial was commenced in respect of method of raising the crude protein content of a low quality ration. The additive was lucerne chaff. The treatments comprised a control, fed low quality chaff (2.7 per cent. crude protein); another group fed cereal chaff; and two groups fed a mixture of low quality chaff and lucerne chaff.

These mixtures were in a proportion respectively to increase the protein content to the level of cereal chaff in one case (mix A), and, in the other, to a level intermediate between low quality and the quality of cereal chaff (mix B). In some groups, supplements of wheat at a level of 3 oz. per head per day were fed daily or twice-weekly.

The trial is continuing. Indications at present are that an *ad lib* ration of this cereal chaff is above a maintenance level, while mix A, fed *ad lib* with 3 oz. of wheat per head per day, has maintained the sheep at a fairly constant weight. Each group comprised sixteen sheep at the commencement of the trial. The trial will operate for at least twenty-six weeks.

Maintenance Rations for Different Breeds of Sheep

The breeds used in this trial were Polwarth, Border Leicester x Merino, and Corriedale. Wethers of approximately eighteen months were fed 60 to 70 per cent. of the British Standards, as a 50/50 mixture of wheat and wheaten chaff. Localities of the trial were the Burdekin Unit at Glenfield, and the Temora Experiment Farm.

At the Burdekin Unit there was also included a group of Merinos fed a ration containing 4 lb. of starch equivalent. This figure is approximately 60 per cent. of the British Standard but has been shown to maintain Merino wethers of 70 lb. for six months, with only a small percentage of losses.

When corrected for wool production, all groups lost weight during the twenty-six weeks trial. Survival percentage was very high in all groups except the Merino groups. The latter had an 80 per cent. survival. The only striking environmental difference was between the Corriedale groups. The Corriedale group at Temora lost 11.8 per cent. of its randomised weight, compared with a 17.3 per cent. loss by the corresponding group at Glenfield.

Effect of Drought on Sheep Fertility

219 Merino maiden ewes were transferred from the Burdekin Unit, Glenfield, to Condobolin Experiment Farm after six months of drought rations.

The ewes were divided into approximately two even groups. One was mated almost immediately on arrival at Condobolin. The other was mated after a recovering period of five months.

Within these two groups there are three sub-groups; comprising the ewes removed from their experimental ration because of weakness.

Body weight of the ewes increased in thirty weeks from 52 to 95 lb. Lambing per cent. of the group mated almost immediately was 73, and the marking per cent. was 41. Lambing per cent. of the group mated after a recovery period of five months was 83, and the marking per cent. was 57.

Within the groups, those sheep fed initially lower quality drought ration had a lambing per cent. of 71 after the first mating, and a lambing per cent. of 90 after the second mating.

The trial is to continue for another mating of both groups.

Recovery of Merino Wethers on Irrigation Pastures

Six-tooth Merino wethers were fed drought rations for three months, and then recovered for approximately four weeks on a 50/50 ration of lucerne chaff and wheaten chaff. The 125 sheep were then transferred to a paddock of approximately 7 acres of irrigation pasture. There was an average increase per week of 1.4 lb., over a period of twelve weeks.

VETERINARY RESEARCH—PIGS

Salmonellosis in Swine.—One outbreak caused by a strain of *Salmonella choleraesuis* which showed resistance to the tetracycline group of antibiotics was investigated. The property made a practice of feeding chlortetracycline antibiotic supplements at all times. It was inevitable that these practices, which are common and encouraged by commerce, should eventually produce this result. It represents both a complication in animal disease control and a hazard to public health.

Dangers in the practice of low level antibiotic supplementation of feed must be recognised.

Inclusion Body Rhinitis (Virus).—This virus disease of pigs, reported initially from South Australia in the latter half of 1959, is now understood to be widespread in that State. Despite a careful check by Departmental officers, of piggeries, in New South Wales, clinical signs of the disease were not detected until June, 1960. Then one piggery came under suspicion.

Comparatively mild symptoms were exhibited by porker-type pigs on this establishment. Suckers remained unaffected.

Laboratory examination of the ventral turbinate bones revealed lesions consistent with the chronic stage of inclusion body rhinitis as described by South Australian authorities. It is interesting that only three porkers died, and all other affected pigs rapidly recovered—without any apparent retardation of growth rate.

The source of infection cannot be traced to any introduced stock within the last twelve months. Further work is in progress in an attempt to transmit the disease, and to demonstrate the existence of the acute stage; so that the diagnosis may be definitely confirmed on this property. As the position stands, the outbreak would appear to be most atypical.

VETERINARY RESEARCH—POULTRY

Infectious Laryngo-tracheitis Vaccine Experiment.—The trials reported in the 1958-59 Annual Report were generally considered unsatisfactory due to the lack of uniformity in many aspects of the vaccinated groups. The need of further controlled trials was apparent.

The first or pilot trial with 300 birds of similar age and breeding has now been completed, and the full trial with 1,200 birds will commence shortly. The value of both lyophilised egg-grown vaccines and tracheal exudate vaccines will be determined by their ability to:—

- protect birds against both intratracheal challenge and contact infection, at varying periods after vaccination;
- stimulate the production of antibodies in the sera, which will be measured by serum neutralization tests.



Maintenance Rations Project at Temora Experiment Farm

Reactions of various breeds (Corriedale, Polwarth, Border Leicester x Merino, and Merino) to maintenance rations at 60 to 70 per cent. of British standards, and in different environments, are being studied in parallel at Temora Experiment Farm and the Glenfield V.R.S. Drought Feeding Unit. (See page 60 for results).

Simultaneous Vaccination of Day-old Chicks against Fowl Pox and Infectious Laryngo-tracheitis.—Outbreaks of these diseases in young birds is a serious threat to the broiler industry, and it has become necessary to vaccinate at an earlier age than usual. This experiment, just commenced, will determine the value of vaccination of day-olds in preventing occurrence of the disease.

Fowl Cholera.—Incidence of this disease in fowls has markedly increased. Several severe outbreaks in commercial turkey flocks have occurred in recent years. Some outbreaks have not been checked even by triple the recommended strength of sulphaquinoxaline. On one property, treatment of individual birds with both sulphaquinoxaline and aureomycin was effective.

Recent reports from the U.S.A. suggest good protection by use of an adjuvant vaccine. So, strains of *Pasteurella multocida* isolated in future will be examined for their suitability for vaccine preparation.

Haemorrhagic Enteritis in Turkeys.—A hitherto unrecorded disease in turkeys in Australia, with severe haemorrhagic enteritis as the only apparent lesion, was seen in two turkey flocks. The aetiology is not yet known. Birds between seven and twelve weeks of age are mostly affected. The disease usually appears within two weeks of the transfer of the birds from the brooder to the range.

Avian Monocytosis.—Experiments have been commenced to test the hypothesis that toxic fractions may be present in meat meals prepared in particular ways, and that they may be responsible at least in part for this disease. Meanwhile aetiology of the condition remains obscure.

Specially prepared extracts of a number of meat meal preparations are being tested. Although a progressive monocytosis has developed in some of the inoculated birds, the disease has been subclinical. It will be necessary to attempt concentration of these toxic fractions.

Sheep Nutrition Research—Shannon Vale Station

Carrying Capacity.—Of the 600 acres on the property, 450 acres are fully pasture-improved and 40 acres partly improved; and an additional 10 acres was sown during the year. There are 2,900 sheep on the property. Wool production for 1,959 was 27 lb. per acre. Because of the marked rise in pasture productivity in the summer, 350 head of cattle were agisted for three months.

The greater part of the Merino flock is being managed as a commercial proposition, and subjected to practices developed over the years. Successful attempts are being made to carry fifteen wethers per acre and ten breeding ewes per acre at set stocking rates.

Pasture Intake; Relative to Body-weight, and Wool Production.—Studies of pasture intake, of each individual, in relation to body weight and efficiency of wool production, have continued.

Dairy Cattle Infertility Laboratory, Berry

Infertility Survey.—Investigations were made in respect of 104 herds. In the area from Milton to Albion Park 93 herds (12.4 per cent. of all herds in the area) were investigated. Fifty-eight (7.7 per cent.) experienced some form of infertility during the year, and 35 (4.7 per cent.) were considered to have satisfactory fertility levels.

Trichomoniasis was present in ten herds; vibriosis was in eleven and possibly four more; non-specific abortions were in eighteen herds; bull infertility in one herd; nutritional infertility in one herd; vaginitis in one herd; cystic ovaries in one herd; and undiagnosed disorders in seven herds.

Of 43 herds investigated for brucellosis, 12 were experiencing abortions, and reactors were present in another six herds.

Herd breeding data have been obtained for 2,000 breeding periods in 1,400 cows. It is now being analysed.

In eleven herds outside the Milton to Albion Park area, vibriosis was identified in six herds, trichomoniasis in one herd, undiagnosed disorder in one herd, and normal fertility was apparent in three herds.

Laboratory Investigations.—The aim of a great part of the work was to enlarge the range of diagnostic tests, check their accuracy, and simplify procedures. The range and results of the work, concerned with tests for brucellosis, trichomoniasis, and vibriosis, have been reported in other papers and summarised in a section of this Report (under Glenfield Veterinary Research Station).

Seven Hills Poultry Experiment Station

POULTRY GENETICS RESEARCH

Recurrent Reciprocal Selection Programme.—This programme for improvement of egg production in crossbreds of White Leghorns and Australorps has been completed. Before it concluded, a comparison of White Leghorns, Australorps, and their reciprocal crosses, in many important production characters, was undertaken.

That comparison revealed the following information:—

- (i) Sex maturity, survivors' production, and hen-house average production markedly responded to hybrid vigour—both between and within breeds. Crossbred egg-production potential for a sire could not be judged from purebred production.
- (ii) Pullets produced from Australorp dams, whether crossbred or pure, showed significantly higher mortality during the laying period.
- (iii) There was a marked difference between White Leghorn and Australorp sex-chromosome for adult body-weight.
- (iv) Birds in cages were heavier and laid more eggs than birds on litter.

Egg Production—Comparison of Selection Flocks.—Three separate selection flocks for egg production have been set up. These are (A) Australorps; (B) White Leghorns; (C) a Synthetic breed, produced from crossbreds between Australorp and White Leghorn.

The first generation to be tested was reared and selected during 1959-60. Production of the "C" flock has been particularly encouraging.

One aim of these selection experiments is to determine whether selection for high egg production in the synthetic breed will combine the favourable characters present in both parent breeds.

Meat Production—Selected Breeding Flocks.—Two separate breeding flocks are under selection, for dominant white, rapid feathering, and body weight at broiler ages. The two flocks have had different breeds combined in the base for selection.

Bodyweight Inheritance—Sex Link.—Data from the various selection flocks of poultry, and from other sources, have provided evidence that bodyweight is sex-linked in poultry, rabbits, mice, and possibly sheep.

An investigation is proceeding and will be continued. Amended selection programmes which take sex-linkage into account will be developed in poultry and mice.

POULTRY NUTRITION RESEARCH

Applied Nutrition

Quality of Meatmeals.—The variation of feeding value of commercial meatmeal samples has been studied. Using seven-day growth assays, differences of 50 per cent. in weight gain have been observed to depend on the sample of meatmeal used.

Samples giving rise to two extremes were examined in detail, but no major chemical difference or difference in response to a wide range of supplements was observed. The project is being continued. Several tests of quality are being examined and related to feeding value.

Processing Variables—Influence on Meatmeal Quality.—In co-operation with a meatmeal manufacturer, samples of wet and dry rendered meatmeals from beef or mutton were prepared and tested. Dry rendering yielded a product greatly superior to wet rendering for chicken growth, while mutton meatmeal was superior to beef meatmeal. These were unique samples of each type of meatmeal. Therefore, generalised conclusions are not yet warranted.

Toxic Factors in Meat-and-Bone Meals.—This study is continuing. Occasional non-toxic samples have been found. The toxic samples have a higher ratio of ferric to ferrous iron than non-toxic samples. It is not yet known whether the ferric iron is the cause of the toxicity.

Chicken Feeding Value of Livermeal.—Inclusion of 5 per cent. livermeal in simple chicken diets has yielded better growth and feed conversion. No single micro-nutrient provided by the livermeal was responsible for this response.

When 0.05 per cent. methionine and 5 per cent. peanut meal were included in the diet, livermeal no longer got a response.

It has been concluded that response to livermeal is due to its higher protein quality by comparison with the grade of meatmeal being fed.

Chicken Feeding Value of Blood Meal.—Inclusion of high-quality bloodmeal, as up to 6 per cent. of chicken diets, and replacing meatmeal, did not cause any decline in chicken growth or feed conversion. In some experiments it improved growth.

A conclusion is that up to 6 per cent. bloodmeal may be fed to chickens, provided it is a high-quality sample. Another conclusion is that the amino acid Isoleucine has been in adequate quantities in diets.

Feeding Value of "Mixed Medic Seed".—This product, salvaged from scoured wool, contains 34 per cent. protein and 16 per cent. fibre. Several experiments have shown that up to 10 per cent. may be fed to started chickens without loss of gain, but with a small decline in feed conversion ratio. The protein of this concentrate successfully replaced peanut meal in one experiment.

Grinding of the seed before mixing in the mash was unnecessary. When fed to newly-hatched chickens, pasting of the vent was a severe problem but growth was satisfactory.

Feeding Value of Mill Offals.—In a series of experiments the aim has been to determine factors which would serve to differentiate between bran and pollard for regulating purposes. It was not possible to differentiate between several samples, in terms of chicken growth or feed conversion, over a wide range of levels of offal. The project will be further extended.

Tallow in Broiler Diets.—The effect of No. 1 grade tallow in broiler diets was extensively studied. The tallow produced no effect on body weights, as at 12 weeks, but improved the feed conversion ratio. Lower grades of tallow were also studied. Even the lowest grade could be satisfactorily fed, as up to 5 per cent. of the diet.

Antioxidants in Chicken Diets.—Use of tallow necessitated addition of an antioxidant to the mash. The sample of B.H.T. (Butylated Hydroxy Toluene) depressed chicken growth, at levels as low as 5 p.p.m. Further samples of this anti-oxidant, and a range of possible replacements, are to be examined.

Feeding Value of Low Grade Wheat.—Four samples each, of F.A.Q. wheat, "B" grade and "C" grade wheat were compared for chicken growth and feed conversion. No difference in performance of the chickens was found as between the grades of wheat.

Fishmeal for Chickens.—Addition of 5 per cent. fishmeal to a series of chicken diets produced growth responses of up to 10 per cent. in short-term assay experiments. Bloodmeal can partially replace the fishmeal. Response to fishmeal is partly but not completely due to more highly available sulphur-amino acid content than in the meatmeal it replaces. Available lysine is not a factor in this response.

Protein Requirements of Laying Hens.—During 1958 and 1959, groups of Leghorn pullets were fed all-mash diets containing 13, 15, or 17 per cent. protein. Egg production, weight, mortality and feed consumption were compared. Egg production was no better on 17 per cent. protein than on 15 per cent. protein. Egg production on 13 per cent. protein was slightly lower than on 15 per cent. protein but the difference was not significant.

It has been concluded that the protein requirement of Leghorns under these conditions was no higher than 15 per cent. and probably was lower. This is in agreement with recent overseas observations.

High Energy Diets for Layers.—This project is not complete. It aims to develop diets capable of producing either higher egg production, or similar production at lower feed intake than is currently accepted.

The diets being fed appear to produce short-term increases in egg production, but not higher production over the whole laying season. Feed per dozen eggs has been reduced by approximately 20 per cent.

Methionine Supplementation of Laying Diets.—This experiment is continuing. Progress results have revealed a production response to methionine supplementation.

Ascorbic Acid in Diets for Hens in Hot Weather.—Following recent overseas reports of the efficiency of ascorbic acid in improving shell quality of eggs during summer months, this experiment was carried out during December-January. Ascorbic acid (100 p.p.m.) was fed to 200 laying hens reaching the end of their first season, and the unsupplemented diet was fed to a further 200 birds. All birds were housed in cages. The flocks contained A.O., W.L., and both crossbreds. The purebred and crossbred pullets were half-sisters.

No effect of ascorbic acid on specific gravity of the eggs, percentage of cracks, or egg production, was observed.

Basic Nutrition

Trials have been conducted to study the basic nutritional requirements of chicken diets; in respect of amino acids, minerals, and drugs, and related growth response and/or toxic effects. Observations from this work include:—

Protein Deficient Diets.—Deficiency of the sulphur-containing amino acids, methionine and/or cysteine is the major defect in protein deficient diets.

Depressed Weight Gain.—The addition of ascorbic acid (100 p.p.m.) to chicken diets depressed weight gain.

Variable Growth Responses.—Variations of from 2 per cent. to 10 per cent. in growth response followed the addition of sodium or potassium sulphate of 0.10 per cent. to chicken diets.

Iron Fraction in Relation to Toxicity.—The iron fraction of some meat and bone meals may be responsible for their toxicity, and is being further investigated.

Furazolidone as Growth Stimulant.—The dry furazolidone at the rate of 0.02 per cent. or lower, acted as a growth stimulant, but at 0.04 per cent. or higher, growth was depressed.

OTHER POULTRY RESEARCH—SEVEN HILLS

Egg Storage Temperature, in re Hatchability and Chicken Growth.—Storage of eggs of 40°F (or 20°F below optimum) damaged embryos, and reduced the hatchability—particularly in the cockerel fraction. The effect was caused in the first 48 hours of storage.

Storage at above optimum temperature (80°F) produced, without sex selection, increasingly greater percentages of dead embryos, as the period of storage increased. There was no difference between storage temperatures in terms of average weight of chickens hatched.

Factors in Egg Quality.—Studies showed a high correlation between shell-breaking strength, and egg specific gravity and weight.

Eggs laid by caged birds had slightly higher specific gravity. Crossbreeds produced eggs of higher specific gravity than either purebred Australorp or White Leghorn.

Wool Research Laboratory—Trangie Station

MATING TIMES AND LAMBING

Autumn 1959 Mating.—557 ewes were to be mated by artificial insemination, commencing 3rd March, 1959, but of these, 36 were already pregnant because of the activities of a group of poll ram lambs. The effective number of ewes mated was therefore 521.

Following three weeks of artificial insemination, ewes were backstopped to single paddock-mated rams for one week. Rams were removed at this time because of a flooding threat.

General lambing results for these ewes were: wet ewes, 68 per cent.; lambs mothered, 77 per cent.

Additional, paddock matings were made. They comprised 263 ewes in the stud, for 82 per cent. wet ewes and 90 per cent. lambs mothered; 286 ewes in the Fertility Flock, for 81 per cent. wet ewes and 110 per cent. lambs mothered; 414 ewes in the Poll Experiment Flocks, for 83 per cent. lambs marked; and 45 ewes in the Poll Progeny Test Flocks, for 78 per cent. wet ewes and 98 per cent. lambs marked.

At this mating there was a higher percentage of dry ewes than usual, largely caused by the shortened mating period—four weeks as against the usual six weeks.

Performance of the Fertility Flock was outstanding, 110 per cent. of lambs from four weeks mating. In general, it was also clear that paddock-joining was superior to artificial insemination.

Spring 1959 Mating.—Mating conditions were ideal, with ewes in excellent condition when rams were joined on 1st September. Incidence of oestrus was high. General lambing results were: from 1,286 ewes mated, 80 per cent. wet ewes, 66 per cent. lambs mothered.

Percentage of wet ewes was at an excellent level for a spring mating, but the usual poor lambing percentage was obtained, due to high lamb losses. A major factor was very low birth weight of lambs, with associated weakness. This was attributed to the very hot summer during foetal growth.

BREEDING INVESTIGATIONS

The following experimental flocks are maintained:—

(i) **Selection Demonstration (S.D.) Flock.**—This consists of a ram-breeding "Nucleus" of 300 ewes, and a "Flock" of 500 ewes. It is maintained with the aim of breeding a high-producing, medium-woolled flock by incorporating fleece measurement into the selection programme.

During selection, clean-fleece-weight is the most important factor considered. There are independent culling levels for excess skin wrinkle, heavy face-cover, and a low number of crimps-per-inch. The S.D. flock was drawn from what was, originally and prior to the commencement of experimental breeding work at this Station in 1943, the "Second Stud".

(ii) **Stud Flock (Reg. Flock No. 78).**—This group is maintained for comparison with the S.D. flock. In the Stud, ewe selection is by visual appraisal only. Ram replacements are regularly purchased (at 300-500 guineas) from a parent stud of the Peppin strain. This flock is a continuation of the original "Top Stud" ewes, and was commenced in 1912.

(iii) **Selection Groups.**—Eight small flocks have been maintained since 1952, each comprising 100 ewes mated to 5 rams. Single character selection for and against clean-fleece-weight, crimps-per-inch, weaning weight, and skin folds, is practised. Groups for and against face cover were commenced in autumn, 1959.

(iv) **Random Flocks.**—Two hundred ewes, mated to 20 rams, were set aside as a control for the selection experiments. Selection of the ewes and rams is at random. At present the flock is split into two equal parts; 100 ewes mated in spring and 100 in autumn. This makes it possible to compare flocks mated at different times of the year.

(v) **Fertility Flock.**—Commencing in autumn, 1959, a flock of 300 ewes x 6 rams was established, to estimate the fertility of our strain under optimum conditions of breeding and management.

OBSERVATIONS ON RESULTS OF THE BREEDING INVESTIGATIONS

Some interesting observations on results of the aforementioned breeding investigations include the following:—

1. **Strong Negative Genetic Association Between Crimps per Inch and Fleece Weight.**—This has been confirmed. Almost the same end result is achieved with these two measurements, whichever one is selected. The independence of folds has been noted, however. Selection for fleece weight lowers crimps but raises folds; whereas the lowered fleece weight, associated with selection for high crimp number, goes with a marked increase in folds.

2. **Independence, or Negative Correlation of Body Weight and Fleece Weight.**—There is a 17 per cent. difference in body weight between weight plus and weight minus, with little associated difference in fleece weight. This confirms Morley's finding that these two characters are either independent or negatively correlated.

3. **Folds in Relation to Body Weight and Fleece Weight.**—An enormous difference in fold score is now operative between "folds plus" and "folds minus" selection groups. The data in this year are unusual. They show a marked advantage for "folds plus" selection groups. The data in this year are unusual. They show a marked advantage for "folds plus", in both body weight and fleece weight. This no doubt reflects the good season. Wrinkled sheep are at a disadvantage in a poor environment, and vice versa.

4. **Culling in Relation to Clean-Fleece-Weight.**—The Stud Flock is again in front of the Selection Demonstration Flock on clean-fleece-weight. This has undoubtedly been caused in part by very rigorous culling, with reduction in the number of ewes in the Stud (1955). The Stud also has the advantage of higher fertility and higher fleece weights of lambs born to the autumn mating.

The higher fertility enables a greater selection differential on the ewe side, and the higher seasonal fleece weights result in greater differences between flocks of different efficiencies.

RESEARCH ON EFFICIENCY OF WOOL GROWTH

The Efficiency Trial.—This was started on 8th August, 1959. Thirty-two ewes chosen at random, from progeny of the following three selection groups, are employed in the experiment: "Fleece plus", 11 ewes; "Fleece minus", 11 ewes; "Random", 10 ewes. They are fed *ad-lib* on hammer milled lucerne (91.4 per cent. dry matter, 17.0 per cent. crude protein). Wool samples are taken from the mid-side patch of each sheep by

close clipping, every six weeks, and a complete set of wool measurements is made. The animals are weighed once every week, after being kept off feed and water for 15 hours. Average body weights of the groups have been as follows: at commencement of the trial—"fleece plus" group 88.2 lb., "fleece minus" group 81.1 lb., "random" group 87.6 lb., at the end of the sixth six-week period, 106.1 lb., 90.3 lb., 102.2 lb. respectively.

Results of the Efficiency Trial.—Results so far from the trial are as follow:—

1. The "fleece plus" ewes, which are heavier in body weight, also have the greatest intake of feed, and give the highest clip of wool cut. The "random" group is in between the other two groups.

2. The indications are that the "fleece plus" group is the most efficient and the "fleece minus" group the least efficient in conversion of feed to wool. On the basis of the clean fleece weight produced from the mid-side samples during the first four six-week periods, the efficiencies of the three groups have been calculated as grams of wool per 100 grams of feed eaten per day. More precise conclusions will be possible when full fleece weights are determined in August, 1960.

3. There has been a constant, gradual decline in the average daily feed intake of the ewes through the third, fourth and fifth six-week periods; i.e., through the summer, when the maximum daily temperature in the sheep house remained well over 80°F. Feed intake improved during the sixth six-week period, with the onset of cooler weather.

4. In spite of the lower feed intake, there was no reduction in the clean fleece production, as revealed by the six-week wool sampling. There was rather a gradual increase in clean fleece weight up to the end of the fourth period.

TRANGIE SHEEP FERTILITY INVESTIGATIONS

Fold Development and Fertility.—Differences in fertility between the "folds plus" and "folds minus" selection groups have now been fully analysed. The average lifetime production of the ewes from the two flocks reveals consistent and enormous differences in favour of the plain-bodied sheep.

Work is now concentrated on the problem of explaining these differences.

Annual Reproductive Rhythm.—Following our demonstration in 1954 that Merino ewes showed a seasonal rhythm in percentage of ewes ovulating and percentage of multiple ovulations, data from a series of autumn and spring matings over the years 1953-59 were examined for confirmatory evidence.

It is concluded from this study that the spring mating traditional in central western N.S.W. deprives the community of approximately 30 per cent. of well-grown lambs.

Ovulation Rate and Incidence of Cystic Endometrium in Merinos.—A survey has been initiated with the co-operation of Homebush Abattoir staff and, to date, eight groups of genitalia—each from 50 slaughtered ewes—have been examined. Presence of cystic endometria has been demonstrated in ewes in five of the eight groups. Of the five groups, only one had been exposed to improved pastures.

ARTIFICIAL INSEMINATION OF SHEEP—TRANGIE OBSERVATIONS

Age Decline in Fertility.—Observations on the 1959 mating results indicate a rapid decline in fertility in ewes after 5.5 years, while age had no significant effect on percentage of multiple births or on the percentage of ewes losing lambs before mothering.

Folds and Face Cover in Relation to Lambing Performance.—There was marked superiority in lambing performance of the flock selected for "folds minus" over the "folds plus" flock, and a superiority of the "face cover minus" flock over the "face cover plus" flock.

Effect of Type of Oestral Mucus.—An association between the type of oestral mucus and subsequent fertility was demonstrated.

Types of Electro Ejaculation Machines.—Considerable work has been undertaken on assessment of the value of several types of electro ejaculation machines.

Simplified Methods of Ram Sterilization.—These studies are continuing.

Dairy Cattle Research—Wollongbar Experiment Farm

Birth Weight and Growth Rate Studies.—All records relating to birth weight and growth rates of Guernsey calves on Wollongbar Farm have been collated. Data have been divided according to sex.

Relationship between weight of dam and weight of calf at birth is being studied.

Studies have also been extended to identical twin calves, not necessarily of Guernsey breed.

Influence of Vetch on Butterfat Production.—A trial is in hand, examining production in terms of butterfat output from *Vicia sativa* under North Coast conditions.

Yields of vetch approach one ton of dry matter per acre, and the five acres sown provided half the daily food requirements for ten cows over 68 days. There was an increase of 362.5 lb. of butterfat from the vetch group compared with the grass (control) group.

In respect of cost of establishing the vetches, a 68 per cent. profit was made on the original investment of £35 for the five acres. The favourable season tended to help the grass fed (control) group.

This trial has been discontinued. A "Feed Year" Production Trial has been inaugurated. It is using an agronomic plan for the twelve months, instead of vetch alone in the late winter—early spring. As well as vetch (*Vicia sativa*), use will be made of subterranean clover and *Glycine javonica*.

Pig Nutrition Research—Wollongbar Experiment Farm

Early Weaning and Scours in Piglets.—Scouring in piglets has hampered weaning experiments at Wollongbar. The scours tend to occur in the period of from five days to four weeks of age, as a light-coloured mucoid type; and also in the age period from four to five weeks, as a black scour. Each of the following has been considered as possible cause of the scouring: use of excessive ferrous sulphate in diets, stale meatmeal, lack of exercise of sows, coupled with excessive feeding, bacterial origin.

Two sows were transferred to Glenfield Veterinary Research Station and observations were made on the litters. These did not support the possibility that scouring was due to a bacterial agent.

There does appear to be some connection between feed intake and scouring, especially when the intake increases rapidly. The aspect of engorgement is postulated.

Further trials at Wollongbar eliminated the possibility of defective meatmeal.

Trials there supported indications that, in a litter, there is an inherent tendency of certain individuals to scour more than litter mates.

Milk-Meal Feeding Experiment.—This experiment was continued. It is comparing the value of milk and meal, alone or in combination. It involves six feeding treatments, using the basic of one gallon of skim milk as equivalent to one pound of meal.

Overfatness of carcase has been a problem, despite food conversion ratios as low as 1.0 lb. of liveweight gain per 2.59 lb. of feed. The diets have been modified, in that, 4.25 lb. of meal was made the maximum level of feeding in the period from 91 lb. liveweight to baconer weight. Food conversion ratios were very good. This aspect is being further investigated.

Sheep and Wool Section

Staff Establishment.—Establishment of the Section was increased by four, to make the effective strength thirty-two. Three of the new positions arose from creation of new Extension Districts for Sheep and Wool Officers in the Western Division of N.S.W., and the other new position is Livestock Officer (Sheep and Wool) at Wagga Agricultural College, to provide assistance for the Lecturer in Sheep Breeding and Management.

Eight new officers were gained; four to fill vacancies caused by resignations (3) and one existing vacancy, and four to occupy positions resulting from increase in establishment. The new officers are stationed respectively one each at Yanco Experiment Farm, Cowra Experiment Farm, Trangie Experiment Station, Condobolin Experiment Farm, New England Experiment Farm, and Wagga Agricultural College, and two at Hawkesbury College.

At present there is one vacancy in the establishment.

Three New Extension Districts.—Three new districts, all in the Western Division, are as follows:—

- (1) Bourke District—comprising the Pastures Protection Districts of Bourke, Brewarrina, Cobar and the western portion of Walgett North District and the eastern portion of Wanaaring District. However, after one month's duty the appointee transferred to Hawkesbury College as Lecturer in Sheep Breeding and Management, leaving the Bourke District vacant. It may not be filled until the end of 1960.
- (2) Broken Hill—comprising the Pastures Protection Districts of Broken Hill, Milparinka, Wilcannia, Cobar, and the western portion of Wanaaring District.
- (3) Wentworth—comprising the Pastures Protection Districts of Wentworth, Balranald and Hillston. Headquarters were to have been at Balranald but difficulty in securing housing there led to the transfer of headquarters to Wentworth.

Creation of the three Western Division Districts was made possible by allocation of Wool Industry Research Trust Funds to meet the salaries and expenses of three Extension Officers for three years. Thereafter the Department of Agriculture was to assume responsibility for continuance of these positions.

There is now provision for eighteen District Livestock Officers (Sheep and Wool), an improved extension coverage for the State.

Extension activities showed a slight increase during the year; despite four districts vacant for periods of one month to three months, and new appointees to certain districts.

A comparison of the major extension activities 1958-59 and 1959-60 has been tabulated:—

District Sheep and Wool Officers Major Activities, in Summary	1958-59	1959-60	Percentage Increase or Decrease
Number of properties visited	2,402	2,463	+ 2.5
Number of sheep classed	290,892	280,477	— 3.5
Value of sheep selected and purchased	£79,081	£76,156	— 3.6
Lectures, Demonstrations, Field Days	253	259	+ 2.3
Ram Sales, Agricultural Shows, etc.	93	167	+ 79.5
Radio broadcasts, publicity statements	260	329	+ 21.0
Competitions	...	30	...

In-Service Training.—A very successful school for sheep and wool officers was held at Trangie Experiment Station in 1959, and a similar school was conducted at Glen Innes in May, 1960. The latter centred around the work of Shannon Vale Nutrition Station, with emphasis on the pasture utilisation and management methods that could be applied in other pasture improvement districts. During the school the C.S.I.R.O. Regional Pastoral Laboratory and Field Station at "Chiswick", Armidale, was visited. Research officers from "Chiswick" also attended sessions of the school.

Other schools attended by some officers of the Sheep and Wool Section were the Extension Service and Methods School at Newport (two officers) and the Irrigation School at Yanco Experiment Farm (six officers).

In-service training as district officers was also provided for sheep and wool officers stationed at Colleges and Experiment Farms and Stations. It gave them opportunities to become familiar with different types of production and the management methods adopted in other districts, and to observe extension methods and techniques used by current district officers.

Two of the officers recently appointed to the Western Division also undertook three weeks in-service training in South Australia to become familiar with the South Australian Merino types of importance in the Western Division districts.

The Merino Ewe Competition.—This, conducted by the Department in association with "Country Life" Newspaper had record entries. There was increased interest in all districts. Interest of local breeders has been further stimulated by the field days associated with the District Judgings and the State Championship Judging. This competition has, over the years, stimulated owners to effect improvements in their breeding flocks. It has been an invaluable means of increasing the effectiveness of the Department's sheep and wool extension service.

Lamb Breeders Ewe Competition.—This continued to be conducted by the Department in association with the Rural Bank of N.S.W. Because of increasing emphasis on the effect of husbandry practices in management of crossbred sheep, this competition needs revision if it is to continue.

Miscellaneous District Competitions.—Local Merino Ewe Competitions, Hogget Competitions, and Lamb and Carcase Competitions have been conducted by district livestock officers (sheep and wool) as a facet of their extension service.

SHEEP AND WOOL SECTION'S LIAISON WITH OTHER INSTITUTIONS

War Service Land Settlement.—There has been less call for assistance to Department of Lands in connection with War Service Land Settlement. However, there has been a marked increase in extension calls by occupiers of War Service Land Settlement holdings.

W.C. & I.C., Stud Property Resumption Proposals.—Collaboration with the Water Conservation and Irrigation Commission has been needed, in connection with proposed resumption of Merino Stud properties within the Coleambally Irrigation Scheme.

Prison Farm Sheep Enterprise.—Prisons Department has been advised in respect of re-establishment of a sheep enterprise on the Mannus Prison Farm, Tumbarumba. It is apparent that a worthwhile sheep enterprise will develop there.

Breeders' Associations.—Close association has been maintained with the N.S.W. Sheep Breeders Association, the Australian Society of Breeders of British Sheep, and the various individual Breed Societies working in the interests of the sheep industry.

SHEEP INDUSTRY TRENDS

The swing towards spring lambing is notable. It is a direct result of extension work by district livestock officers (sheep and wool) and is translating the results of research into practice.

Lambing Times.—Spring lambing percentages were highly satisfactory. Many properties marked in excess of 100 per cent. The autumn lambing, while satisfactory, was affected by poor nutritional conditions in most areas. However, losses through malnutrition were less than expected in the below average seasonal conditions.

Lamb Production.—Lamb prices had commenced to fall in 1958-59, and they continued at a low level throughout the latter half of 1959 and up to May, 1960. Then prices returned to a more payable level. Low prices for lambs, coupled with high production costs and the necessarily more intensive management and husbandry, have led many lamb producers to consider a change to wool production. This, in a marginal environment, does not mean a drastic change. Mere substitution of the type of ram, to use the Merino in lieu of Border Leicester, re-establishes the producers in a woolgrowing enterprise. In the pasture improved higher rainfall areas a change from lamb production to wool production is a major decision and not decided lightly.

In a number of instances the breeding of prime lambs has been discontinued, and husbandry of Merino wethers as woolgrowers has been undertaken. In many cases the breeding flock has been reduced and Merino wethers, to the full carrying capacity of the property, have been brought in. Economically it is quite sound, and has resulted in higher nett incomes.

Wethers run on highly developed improved pastures have suffered severely from balanitis; so severely that it was only possible to keep them for one or two years before the incidence was excessive. However, management, aimed at a high degree of pasture utilisation and the feeding of the wethers in accordance with their productive needs, has reduced the incidence of balanitis to a level easily coped with. Concept and practice of the high rate-of-stocking method with wethers is a direct outcome of the Department's Shannon Vale Nutrition Station work.

Autumn Shearing Trend.—There has been further adoption of autumn shearing in a number of districts, particularly on the tablelands. There it has been adopted as an alternative to pre- or post-lambing shearing.

Advantages of autumn shearing are mainly confined to the tableland districts, where it has greatly simplified management. The shearing is confined to dry sheep; mating is more satisfactory; the ewes are not carrying heavy fleeces through wet winter weather; and lambing takes place with some five or six months wool. Increased autumn shearing has assisted the spread of available labour and has more evenly distributed the demand on transport and storage.

Increased Use of Mules Operation.—There has been much more extensive use of the Mules operation as a preventive measure against crutch strike. A lot of the Department's extension service has been devoted to getting wider use of the operation. It is of interest that provision of an extension service in the Western Division has been followed by much greater interest and activity in protecting sheep from fly attack.

Fodder Conservation Trend.—Fodder reserves built up during 1958-59 have been seriously depleted by the marked need for supplementary feeding in the past year of below-average conditions. Oat grain, practically unsaleable at the harvest of 1959, was retained on the properties and has proved invaluable during the current dry season. At present, prospects are not very bright for the complete replenishment of fodder reserves required for the high sheep population of New South Wales.

Trends in Flock Ram Prices.—Values for British Breed Flock Rams have stayed at a level bearing at least some relationship to lamb prices. Extreme prices previously received at auction have receded to a more satisfactory level. Major Merino studs have concertedly tried to maintain flock ram prices at levels current when wool values were much higher; but smaller studs are offering rams at lower prices.

SHEEP PROJECTS AT DEPARTMENTAL INSTITUTIONS

Condobolin Experiment Farm.—The sheep total is 3,354; including 1,100 lambs bred during 1960. This total will be reduced in September, 1960, by disposal of aged Merino ewes, and by transfer of wether lambs and other surplus sheep.

The current projects at Condobolin are:—

- (1) Fixation of the Border Leicester x Merino: This project is proceeding satisfactorily, with an 88 per cent. lambing from the Merino ewes and 91.5 per cent. from the F₁ and F₂ crossbred ewes. Some 1,600 F₁ and F₂ ewes are now available. Of these, 1,050 will be mated in October, 1960.

Arrangements have been made for a livestock research officer from Trangie Agricultural Experiment Station to undertake the associated genetic studies.

- (2) Drought Feeding Recovery.—Mating of ewes from the Drought Feeding Unit at Glenfield continued; breeding performance of the ewes is being studied.

Cowra Experiment Farm.—The sheep total has been increased to 2,364. The breeding flock has not been increased; but 500 scavenger sheep have been kept to provide ration sheep for the Department's Colleges. A big reduction will be made by sale of lambs, and by transfer of sheep for other Departmental uses.

Lamb-breeding and Early Weaning Trials have continued at Cowra.

Grafton Experiment Farm.—A pilot lamb-raising flock of 85 ewes has been maintained, for information on lamb production on the coast. Problems arising from excess spring rainfall have highlighted the work.

The aim is a management pattern for the coast that will control internal parasites and cope with excessive summer pasture growth.

Leeton Experiment Farm.—The sheep total is 2,864. A reduction has been made for greater flexibility in the research.

The projects at Leeton are:—

- (1) Production per Acre Project: This is a new one and will continue for two or three years.
- (2) Early Weaning, and Hormone Implants: Work is proceeding on early weaning of lambs on low dosage rate of hormone implants.
- (3) Ewes' Reproductive Variations: Seasonal variations in reproduction in Border Leicester x Merino ewes, and the incidence of oestrus, fecundity, and lactation are being studied.

New England Experiment Farm.—The total of sheep is 1,104. No new project has been undertaken. The lamb raising trials have continued.

Shannon Vale Nutrition Station.—The sheep total is now 2,718. The management pattern and additional areas of brown pasture have made this increase possible.

In an earlier section of this Report there is further reference to the Shannon Vale work. It has made outstanding contributions to extension service concerned with flock and feed management.

A 16 mm. cine film depicting the Shannon Vale story and its application to other pasture improved areas of Australia is in the course of production. Summer and autumn shots have been filmed. The film will be completed late in 1960.

Trangie Agricultural Experiment Station.—The number of sheep at 30th June, 1960, was 5,507. Practically all sheep at Trangie are used in Merino sheep breeding projects which have been reported in an earlier section of this Division's report for the year.

A development has been the establishment of a flock of South Australian-type Merino sheep (Bungaree), for research projects and comparison with the Trangie Station's Peppin flock.

Temora Experiment Farm.—The sheep total is about 1,700. It will be reduced by disposal of surplus.

The projects at Temora have been:—

- (1) Maintenance Level of Feeding: This new project, to determine the level for Corriedale, Polwarth, and Border Leicester x Merino wethers was carried out concurrently at Temora Experiment Farm and the Burdekin Unit at Glenfield Veterinary Research Station. From this and subsequent work it will be possible to evaluate further the results of the Corriedale and Polwarth breeding trial.
- (2) Poll Dorset Stud: This has been developed to the stage where rams are available for sale. Thirty young Dorset Horn stud ewes were purchased, to establish new blood lines.
- (3) Corriedale vs. Polwarth, Commercial Trial: This project is yielding valuable information. The results so far achieved will be enhanced in value when related to the maintenance levels required for the two breeds.

Early weaning of lambs practised in this trial has established the value of this practice in assisting in achieving more effective use of available feed.

Tamworth Experiment Station.—There are 500 sheep. Previously this relatively new Station has been a holding site for ration sheep for the two Agricultural Colleges. This year it was stocked with 500 Border Leicester x Merino weaner ewes, preparatory to some investigational projects in 1960-61.

Yanco Experiment Farm.—The sheep total is 1,091. No new work has been undertaken. Established projects continued.

Wollongbar Experiment Farm.—There are only 30 sheep, for silage digestability research.

Beef Cattle, Horses, and Goats Section

BEEF CATTLE

General Extension Services.—This Section has availed itself of a wide range of means (radio, press, field days, schools, demonstrations, competitions, individual contacts, etc.), of extension. A Beef Cattle School at Bathurst in March, 1960, drew an attendance of fifty-six producers, and requests from several other areas for similar short-term schools.

As yet the Section has only one of its officers posted in a district for extension work in the field, but rapid expansion of this system will occur shortly.

Beef Carcase Competitions.—Only two country killing centres held beef carcase competitions this year. They were the Northern Co-operative Meat Works, Casino, and the Goulburn Municipal Abattoir. Both competitions were judged by officers of this Section. The competitions have been useful means of extension work. Field days were held in association with the judgings, and many aspects of production and quality were discussed and demonstrated there.

Beef Cattle Breeders' Competition.—For the eighth successive year this competition was held. Its sponsors are the Rural Bank of N.S.W., the Agricultural Bureau of N.S.W. and this Department of Agriculture. This time there were some 200 entries; compared with 147 in 1958-59. The competition was most successful, in all respects. An officer of the Section continued to act as State Judge. Many field days were held; in association with the District Judgings and the State Judging. The extension service effectiveness of the competition, especially through the field days, has been marked.

Investigational Work.—At Leeton Experiment Farm the Special Veterinary Research Officer (Beef Cattle) has continued a number of projects, including: "Production Per Acre"; "Early Weaning of Calves"; "Long and Milled Hay as a Supplement to Pasture"; "Effects of Hexoestrol on Growing Cattle".

The "Improvement of Cattle Project" (No. 108 under the Commonwealth Agricultural Extension Grant) has been continued on private properties at Bombala and Newbridge.

An investigation into the effects of implanted hexoestrol has continued at Belabula Farms, Canowindra.

Investigation into the economics of vealer production through dairy herds has commenced at Wollongbar and Grafton Experiment Farms. An Angus bull has been joined to Guernsey females at Wollongbar, and an Angus bull has been joined to A.I.S. females at Grafton. Calving has just commenced.

Stud Beef Cattle.—The numbers of stud cattle on hand have remained almost stationary. Details have been recorded in other papers.

Activities in the Poll Shorthorn Stud, at Wagga Agricultural College, have been greatly restricted by an outbreak of John's disease.

In the Angus Stud, at Trangie Agricultural Experiment Station, the progeny of "Pro Ben of Balfroon" (imp.) has been most satisfactory. However, he is developing unsoundness in hind limb joints, and his future usefulness appears limited. The Angus Society of Australia has authorised his use by artificial insemination. Stud Angus cattle are also bred at the Leeton and Wollongbar Experiment Farms.

For the Poll Hereford Stud, at Hawkesbury Agricultural College, a replacement bull "Pylara Jock", has been purchased. His cost was 800 guineas.

Stud Bull Sales.—During the year 22 stud bulls (Angus, Poll Hereford, and Poll Shorthorn) have been sold. They realised a total of £7,518, averaging slightly more than £380 each.

Competitive Exhibits.—Angus, from Trangie Agricultural Experiment Station, and Poll Shorthorn, from Wagga Agricultural College, were exhibited at the 1960 Sydney Royal Show. The Angus bulls' results included a Reserve Champion, five 1st prizes, two 2nd prizes and two 3rd prizes. The Poll Shorthorns scored one 3rd prize.

Commercial Beef Cattle.—The Department's herds provided ration beef for the two Agricultural Colleges and for Yanco Experiment Farm and Trangie Agricultural Experiment Station. Statistical detail regarding them has been recorded in other pages. The numbers have increased from 474 to 573, but this includes 40 head of steers purchased to control pasture growth at Grafton Experiment Farm.

HORSES

The Department has on hand 242 horses, an increase of six during the year.

Service to Private Mares.—A total of 37 privately owned mares were sent to be served by Departmental stallions in the Hawkesbury and Wagga Agricultural College Studs.

Revenue from this source would be £467 10s. 0d. for light mares, at 10 guineas, and £10 10s. 0d. for Clydesdale mares, at 5 guineas.

Competitive Exhibits.—The Department exhibited two stallions, a colt, four mares and three fillies at the 1960 Sydney Royal Show, from its Arab Stud at Wagga and Hawkesbury Colleges. The team won the prizes for Supreme Champion, Champion, and Reserve Champion; also two First Prizes, two Second Prizes, and five Third Prizes. A total of 13 horses sold yielded £993 9s. 2d.

The Department's imported Arab stallion "Razaz" in five appearances at the Sydney Royal Show has been Champion Arab stallion three times, Reserve Champion once, and has filled second place in his class once. The Supreme Championship he won this year was inaugurated at the 1958 Sydney Royal Show.

SAANEN GOATS

The number of goats at Condobolin Experiment Farm has risen from 79 to 97, including an increase from 73 to 89 in the number of females, because of the need to retain a large number of the female progeny of "Mostyn Marcel" (imp.). He died after only one season's use at Condobolin. Detailed statistics have been recorded in other papers.

Record Production Achievement.—An outstanding achievement in the Stud was the setting of an Australian record for 24 hours milk production under official test. This was done by "State Nefertiti 3rd". She produced 21.3 lb. milk.

Competitive Exhibits.—Ten Saanen females from this Stud were exhibited at the Sydney Royal Show. Between them they gained a Championship, a Reserve Championship, ten First, two Second and six Third prizes.

Service to Private Does.—Privately owned does sent to be served by Departmentally-owned bucks numbered 35.

Stud Sales.—Sales from the Stud comprised 16 bucks (£328) and 2 does (£163).

POULTRY SECTION

Industry Trends.—Egg production was about 53½ million dozen, an increase by 16 per cent., compared with the previous pool year. During the first six months many farmers took advantage of the favourable ruling price for grain sorghum. Much more of this grain was used than in former years.

Production of poultry meat increased sharply, reflecting rapid development within the broiler industry. Demand for poultry meat increased to an extent that shortages occurred, mainly over the latter half of the year.

Most leading hatcheries are concentrating their breeding resources on production of superior meat-type lines. It has been difficult to measure precisely the extent of this increase, but several hatcherymen report having sold five to six times the normal number of meat-strain day old chickens this year.

Staff Situation.—This has remained unsatisfactory. Difficulty in attracting suitable applicants is the reason. There are vacancies for three livestock officers for extension work and one livestock officer to engage in research activities.

The position of district livestock officer (poultry) at Gosford has remained vacant; with the livestock officer (poultry) from Parramatta continuing to visit Gosford area one week per month. The area from Gosford to Maitland is major poultry producing territory and needs full-time services of a district officer.

In-Service Training.—The Poultry Experiment Station, Seven Hills, offers an excellent medium for in-service training of junior officers but the present staff shortage does not permit stationing a younger officer there to assist the work whilst gaining valuable experience.

Extension Services.—Four livestock officers were engaged in district extension work; respectively one in the Cumberland, Parramatta-Gosford, Wagga, and Tamworth areas. Their work included farm visits, preparation of poultry literature, press articles, radio broadcasts, lectures and discussions at farmer meetings, participation at field days. The following figures relate to the officers' field activities and give an indication as to the extent of these duties:—

Visits to private farms	1,629
Field days attended	30
Visits to Departmental farms and Government Institutions	27
Judging at shows	10
Poultry schools conducted	6
Attendance at meetings	33
Lectures delivered	26

In addition, press articles and radio talks were prepared. Visitors—both interstate and overseas—including Colombo Plan and veterinary students, were accompanied on farm visits. The officers also acted as inspectors under the Stock Foods Act.

As in former years some culling of flocks was undertaken, but the aim has been to demonstrate principles and techniques of culling, not a comprehensive culling service for farmers.

Assistance was given in the planning and operation of farms engaged in all types of poultry production. A marked feature of the year was the great number of enquiries concerning establishment of units to cater for the increased demand for broiler chickens.

N.S.W. Poultry Improvement Plan (Eggs).—Twenty-two co-operating breeders continued work under the Plan, and one more farm also commenced breeding operations. Random samples of chickens were taken from each farm, to be tested at Hawkesbury Agricultural College. Farms already entered in official, open tests were not required to submit further samples of pure bred stock.

The Plan continued to serve its useful purpose. It has stimulated increased interest in breeding. Hatchery groups formed to extend the scope of operations are testing two and three times the number of family lines required as a minimum for effective participation. Progress will be gauged by results of open, random-sample tests.

Official Laying Tests.—Official testing of pullets by random-sampling is a universally accepted method of measuring the degree of improvement effected by selective breeding.

To give a more reliable evaluation of the quality of each breeder's stock, the sample size has been increased from 40 to 105 pullets. Each sample is divided into three replicates, with two of 40 in litter-floored sections and one of 20 in laying cages. It is the largest sample-size of all comparable tests in the Commonwealth. Accordingly, most of the testing facilities at Hawkesbury Agricultural College will be needed, to test 18 separate lines.

Twenty-five applications were received for the 1960-61 test. It is proposed to erect more housing-sections to accommodate all applicants. These will be financed from entry fees payable by competitors.

The Original Egg Laying Competitions.—These, operating in three divisions, have been continued. This method of testing has operated for sixty years but is now considered obsolete. It will be reduced next year to only one section; to cater for smaller breeders, and those wishing to test pure-bred lines.

A Broiler Test.—This test, preliminary to a proposed random-sample test for poultry meat production, was conducted at Hawkesbury Agricultural College. The object was to compare the relative growth and feed conversion—efficiency of 500 meat-strain chickens, with crossbred cockerels from egg laying breeds. The test gave an indication of the progress of breeders in evolving special strains for year-round broiler production.

POULTRY FACILITIES AT DEPARTMENTAL INSTITUTIONS

Poultry Experiment Station, Seven Hills.—A section comprising 48 pens for poultry nutrition research has been completed. A building for production and testing of broiler strains will be completed when further funds are available.

A detailed summary of the many investigational projects in hand at Seven Hills Poultry Experiment Station is presented earlier in this report of the Division of Animal Industry.

Wagga Agricultural College.—A turkey-raising unit was established to demonstrate modern production methods. The section is equipped to raise 1,000 turkeys per year, and will be a valuable extension medium for farmers in this most important turkey-producing area. Turkey-raisers from all States attend the annual short-term school conducted at the College.

Establishment of this turkey-raising unit has filled a long-felt need. It enables the Department adequately to demonstrate up-to-date methods.

Additional accommodation, for 1,200 layers, has also been provided in the College poultry section.

Hawkesbury Agricultural College.—Facilities in use for demonstration breeding work are to be used in extending the scope of official, Random Sample Tests. Otherwise it would not be possible to test the stock from all applicants.

Additional shedding and equipment needs are inevitable in the light of proposed tests of broiler strains. Meat production has become an important section of poultry industry.

The annual field day at the College attracted 1,300 producers. This was in great part because the day was so much concerned with broiler production.

Pig Section

Industry Trend.—Pig raisers had a profitable year despite fluctuating pig prices. Moreover, the year closed on a rising market, and demand for all classes of pig meats is such that prices are likely to remain up for some months.

Swine Compensation Act, 1928 (as amended), and Swine Branding Act, 1940.—In 1958 the Swine Tax was reduced from 2s. to 1s. per carcase, but continued improvement in the pig diseases position made it possible to halve the tax again during the past year. Thus the current rate is 6d. per carcase. It is noted that the rate of tax was 1s. in 1928, when the Act was introduced; reduced to 9d. in 1935; increased to 1s. 3d. in 1945 and to 2s. in 1948; reduced to 1s. in 1958, and to 6d. in 1960—the lowest rate on record.

Meantime, it is most satisfactory that the credit balance in the Swine Compensation Fund was approximately £103,000 at 30th June, 1960.

Staff.—The establishment strength remains at twelve livestock officers; the Principal, five Seniors, and six others. One of the livestock officer positions is vacant.



Bacon Pig Carcase Competitions as Extension Aids

Livestock Officers of the Division of Animal Industry judge entries in the competitions; and discuss with the competitors, and other producers, the results of their feeding and general husbandry programmes. Similar procedure is followed in respect of other types of livestock.

Extension and Regulatory Services.—The activities of livestock officers of the Pig Section in extension and regulatory duties are summarised in the following table; with the preceding two years for comparisons:—

	1957-58	1958-59	1959-60
Farms visited	975	1,301	1,397
Meetings attended	60	55	62
Pig Sales attended	81	111	139
Field Days attended	47	36	61
Bacon Factories visited ..	29	48	79
Experiment Farms visited	68	56	147
Shows attended	27	38	26
Lectures and demonstra- tions given	81	111	108
Stock Foods Act Inspec- tions	17	—	3
Broadcasts	59	49	75
Swine Branding Act In- spections	26	34	30

In addition there was a constant stream of requests for advice on all aspects of pig raising. These were dealt with at personal interviews, by correspondence, and by telephone. Many thousands of copies of pamphlets on breeding, feeding, housing, marketing and management of pigs were distributed.

Numerous press articles were prepared and released to daily and weekly newspapers, city and rural.

Assistance to Other Departments.—Pig herds at institutions controlled by the Departments of Prisons, Health, and Education were inspected; and advice on management was given. Breeding stock for herd-replenishment were also supplied to them from Department of Agriculture stock as required. The value of pigs sold from Government-owned herds during the year is estimated at about £90,000.

Aid to Other Bodies.—Technical advice was also furnished to various farmers' organisations, the Junior Farmers' Club movement, the Australian Pig Society, The Royal Agricultural Society of N.S.W., numerous country Show Societies, and the Australian Meat Board.

Competitive Exhibits.—Support was given to Agricultural Show Societies. Teams from the Wagga Agricultural College and Grafton Experiment Farm herds were successfully exhibited at the local shows. Championship awards were gained at both centres.

Entries from the Wagga and Grafton herds were made also in the Annual Australian Meat Board Bacon Pig Carcase Competition; and Grafton's exhibit gained the State Championship. There were 135 in the competition.

Departmental Herds.—The Hawkesbury, Wagga, Wollongbar and Grafton pig herds were again used mainly for student instruction and for research. Stud pigs also were sold to farmers. The number of stud pigs sold to farmers was 190; more than double the number (79) to them in 1958-59. This reflected the year's improvement in the economy of the pig industry.

Apiculture Section

Industry Trends.—N.S.W. honey production was the heaviest since the record season of 1948-49. Most of the honey was of choicest quality and came from Eucalypts, in particular. Satisfactory honey crops were also produced from lucerne. White clover also yielded well, in the north.

The heavy production created marketing difficulties. Although a considerable amount of honey was exported, the returns to apiarists for export sales were at amounts considered to be less than the average cost of production.

A poll of honey producers in N.S.W. was held under the Marketing of Primary Products Act, on the question of whether a N.S.W. Honey Marketing Board should be established. Producers owning one hundred or more hives of bees were entitled to vote. Six hundred and twenty-two ballot papers were posted by the Returning Officer and 91.42 per cent. voted. The number of votes in favour amounted to 47.47 per cent.; the number not in favour amounted to 52.53 per cent.

Bee Diseases.—Minor outbreaks of American Foul Brood occurred and were controlled at Glen Innes, Inverell, Singleton, Bathurst, Carcoar, Goulburn, Katoomba, and in the County of Cumberland. No serious outbreaks occurred.

Losses caused by the protozoan *Nosema apis* were small. Most commercial apiarists operated their hives in inland districts throughout the season. Conditions did not favour *Nosema*. Similarly, losses due to Sac Brood were negligible.

Presence of Acarine Mites in Imported Bees.—Officers of State Departments of Agriculture assist the Commonwealth Quarantine officers with the care and handling of the imported queen bees. These are transferred to fresh cages and given a fresh escort of young worker bees. The queen bees are examined externally, and the escort bees are killed and examined internally. Most of the queen bees imported are for New South Wales destinations. They are mainly from the United States of America, Italy, New Zealand and Yugoslavia.

Considerable time has been required in the care and examination of such importations.

During the year, a consignment imported into Queensland from California, U.S.A., was found to contain certain external mites. It is not yet known whether the mites were capable of causing Isle of Wight disease, or whether they were *Acarapis externus* or *Acarapis dorsalis*, two external mites which do not not invade the trachea.

Extension Services.—The revised edition of "Bees and Honey" was received from the Government Printer. This 4th Edition was extensively revised by officers of the Apiculture Section, and enhanced by many new photographs and drawings. The book is designed to meet the needs of commercial beekeepers, but is also of value to bee hobbyists and to people who keep bees for pollination of certain crops.

A successful short-term school for beekeepers was held at Hawkesbury Agricultural College during January.

Livestock officers of the Apiculture Section addressed beekeepers at their local meetings and attended Agricultural Bureau and Departmental field days, etc.

Departmental Apiaries.—Satisfactory progress was made with the bee-breeding programme at Hawkesbury Agricultural College. Further development of the apiary at Tamworth Experiment Station occurred.

Building of a new honey house at Wagga Agricultural College was postponed pending funds.

Regulatory Services

CATTLE COMPENSATION ACT

Fewer Claims.—Some 6,677 claims were dealt with, involving 11,328 animals. The total compensation paid was £189,465.

This represents a decrease of 3,056 claims, of 6,595 animals, and of £104,016, by comparison with 1958-59. These decreases were because of (a) the increased market value of cattle generally, increasing the value of suspect beasts; (b) the greater value of suspect beasts, increasing the residual value to a point where in a number of cases the residual value exceeded the nett compensation, and thus no claim was made; and (c) the continued greater number of suspects being sent to abattoirs for disposal instead of being slaughtered on the property.

Payments Percentages, per Disease.—Of the payments this year, 68 per cent. were in respect of tuberculosis, 16 per cent. for cancer, 11 per cent. for actinomycosis, 2.7 per cent. for actinobacillosis, 0.9 per cent. for trichomoniasis.

Claims Refused.—In addition to the above, 101 claims were refused for various reasons, the most common being for late notification of disease (61), detection of suspect in saleyard without permission (14).

Continued Increase of Fund.—During the last four years there has been a decided increase in the balance of the Cattle Compensation Fund at the close of each financial year. This build-up of funds is seen more clearly in the figures as follows:—

Balance as at 30th June, 1957—	*£24,157 10s. 3d.
Balance as at 30th June, 1957—	£12,998 8s. 7d.
Balance as at 30th June, 1959—	£109,599 2s. 7d.
Balance as at 30th June, 1960—	£237,789 1s. 8d.

* Including £15,000 on loan from the Treasury.

The balance of the Fund at the end of 1959-60 is the greatest since the fund came into existence.

SWINE COMPENSATION ACT

Swine registers maintained by butchers were regularly inspected, primarily by the veterinary inspectors and rangers in the various Pastures Protection Board districts.

STOCK FOODS AND MEDICINES ACT

Applications for Registration of Medicines.—Of the 1,763 applications for registration of stock medicines, 1,657 were granted registration. Of the remainder, 27 were withdrawn, one was refused, and 78 were still under consideration at the end of the year.

Problems Encountered.—The Board faced a number of problems regarding registration of medicaments. The more important were (a) the claims made by wholesale dealers relating to dipping materials for the control of sheep itch mite (*Psorergates ovis*), (b) correlation of such factors as purity, particle size, and dose rates, relating to phenothiazine drenches for the treatment of worm infestations in sheep, (c) the role worms may play in growth promotion of cattle, sheep and poultry.

Applications for Registration of Stock Foods.—Some 1,206 applications were finalised. They were from 208 wholesale dealers. A number of applications, from 109 individual firms, were still being considered at the close of the year. The detailed check of applications, by veterinary officer, continued. Good liaison with manufacturers continued, to the benefit of all.

COMMONWEALTH QUARANTINE ACT

The volume of work generally associated with administration of the Commonwealth Quarantine Act increased considerably, to such an extent that only with difficulty was it all undertaken.

Prohibition Reviews.—A close watch was kept on the world disease position in relation to risks involved in the importation of the various species of animals.

Importation of pigs from Northern Ireland and the Republic of Ireland was reviewed, and permitted as from October, 1959. However, as evidence came to hand of the existence in Ireland of a form of thinitis, and as Ireland imported pigs from England, where atrophic rhinitis exists, the embargo was re-imposed in January, 1960. It was re-imposed before any importations were made. On 16th June, 1960, an embargo was also placed on the importation of pigs from New Zealand, as the authorities there were accepting pigs from Ireland.

At the close of the year, therefore, an embargo was in force prohibiting the importation of pigs from all countries of the world. The complete prohibition remained on importation of cattle, sheep and goats from all countries.

Importation of bees was also reviewed, and action was taken to strengthen the defences against introduction of the disease Acariasis caused by a mite (*Acarapis woodii woodii*).

Import Increases.—The number of animals imported showed a slight increase over last year. Main increases were in the case of horses from New Zealand, queen bees from United States of America, dogs from United Kingdom, and fish from Hong Kong, Singapore, Thailand, New Guinea, New Zealand, and United States of America.

Attempted Smuggling.—One case of attempted smuggling of birds occurred. An officer of the Department of Customs and Excise detained a man leaving a wharf at which a vessel had arrived that day. The man was discovered to have two small mosquito-netting bags, filled with 35 finches, pinned to the inside of his coat.

For some time smuggling of small cage birds has been suspected. This case confirmed it as a reality. The risk of introducing disease is great. Every endeavour is being made to prevent further cases.

Animal Products Problem.—Importation of animal products again required the constant attention of the Animal Quarantine Service. Regular importations of casings, hides and skins, feathers, wool, and tinned meat products increased in volume over the previous year.

Passengers' Luggage.—All ships arriving were met. Officers of the Animal Quarantine Service co-operated with Customs Officers in the search of baggage for illegal importations of such articles as salami, other meat products, cheese, and certain Eastern foods.

Parcels Post.—The volume of goods subject to quarantine control, arriving from overseas by parcels post, exceeded all expectation. Difficulty was experienced clearing such goods and keeping ahead of other regular work during November, December and January. Considerable quantities of prohibited goods were seized and destroyed.

Ships' Pets.—Strict supervision over pets on overseas ships was continued. A number of animals had to be destroyed, as the respective Master refused to sign the appropriate bond. In one case a small greyish-brown monkey bonded by the vessel's Master disappeared from the vessel at Sydney. Investigations failed to reveal a lead to the monkey's whereabouts. The Shipmaster's Bond signed by the Master was estreated.

MEAT INSPECTION SERVICE

The high rate of cattle slaughtering continued into July, 1959, but then quickly fell away and remained at a low level at most abattoirs throughout the twelve months.

Total cattle slaughterings for the year ended 30th June, 1960, were substantially lower than for the previous year. The number of sheep slaughtered at all abattoirs markedly increased, particularly at country abattoirs.

The increased sheep kill necessitated appointments of additional meat inspectors at Gunnedah and Wagga. Other new positions created were for meat inspectors to replace Council-employed inspectors at Goulburn and Inverell.

As a result of a greater output of qualified meat inspectors from Sydney Technical College, problems of recruitment were largely overcome. No difficulty was experienced in obtaining eight well qualified meat inspectors to fill the four new positions created and to replace four meat inspectors lost by resignation or retirement. One vacancy, through death of a meat inspector, remained at 30th June, 1960.

State Abattoir, Homebush Bay.—There were marked reductions in the numbers of cattle and calves inspected, a small reduction in pigs, and a significant increase in sheep. Variations from the 1958-59 figures were: Cattle, —22.5 per cent; Calves (including heavy weaners), —27.5 per cent; pigs, —1.4 per cent; sheep, +10.9 per cent.

Reduced cattle and calf kills were not balanced by a reduction in inspection strength, as the rate of slaughter per hour was not materially reduced. On the other hand, additional meat inspectors were required for inspection of sheep, as a fourth mutton-chain operated throughout the year.

Ante and Post Mortem Inspections.—Besides inspection of stock after slaughter, to determine fitness for human consumption, meat inspectors stationed at the State Abattoir did the ante-mortem inspection of cattle, both at Flemington saleyards and immediately prior to slaughter; ante-mortem inspection of pigs; special post mortem inspection of suspect and tuberculin reactor cattle; and the inspection of all meat passing through the meat market.

Hygiene of Meat Handling.—They also supervised the hygiene of meat handling, and inspected the retail butchers' shops in the metropolitan area.

Homebush Bay Meat Market.—At the Meat Market, Homebush Bay, meat entering the Metropolitan Abattoir Area was re-inspected; as a check against deterioration in transit, and to ensure that only meat derived from approved abattoirs and subject to full meat inspection was sold within the Area.

Close attention was paid to the hygiene and suitability of vehicles used for carriage of meat from the Market.

Meat for delivery under contract to Government Institutions was inspected for conformity with contract conditions.

Policing the Meat Industry Act.—Policing of the Meat Industry Act with regard to introduction into and sale of meat within the Metropolitan Abattoir Area, and the branding of lamb, was carried out; by regular inspections of all premises to which introduced meat was consigned, and the inspection of retail butchers' shops.

Butchers' Shop Inspections.—Some 2,725 inspections of butchers' shops were made. Fourteen breaches of the Act were detected; involving sale of unbranded lamb in one instance, and sale of meat not bearing the Department of Agriculture inspection stamp in the remainder.

Warning letters were sent to ten persons in respect of sale of meat not bearing the Department of Agriculture inspection stamp. In a further three such cases, quantities of unstamped meat were seized.

One firm was warned by letter, following failure to notify intention to introduce meat into the Metropolitan Abattoir Area. One person was prosecuted for sale of unbranded amb.

Unclean or Unsuitable Vehicles.—Offences involving use of unclean or otherwise unsuitable vehicles for carriage of meat from the State Abattoir resulted in four prosecutions and the despatch of two warning letters.

Other Slaughtering Within the Metropolitan Abattoir Area.—In addition to the State Abattoir work, meat inspectors were stationed at two privately owned abattoirs, six private slaughter-houses and two knackeries.

A staff of eight meat inspectors, located in the City area, was engaged in re-inspection of meat entering the Metropolitan Abattoir Area, inspection of meat for delivery under contract to Government Institutions, and the inspection of retail butchers' shops.

Knackeries.—Meat inspectors at two knackeries supervised the slaughter of 18,932 horses and eleven cattle for animal consumption, under an arrangement with Department of Public Health.

Inspections for Colo Shire.—From January, 1960, meat inspection at a slaughterhouse at Wilberforce was done for Colo Shire Council. This was because of the absence of the Shire's Health Inspector on extended leave.

Reduced Killings.—By comparison with the previous year there was a significant drop in the number of cattle inspected within the Metropolitan Abattoir Area at abattoirs and slaughterhouses other than the State Abattoir. However, the number of sheep inspected showed a marked increase. Variations in stock inspected were: cattle, — 17.4 per cent; calves (excluding heavy vealers), — 12.4 per cent; pigs, + 12.8 per cent; sheep, + 27.9 per cent.

Abattoirs Outside the Metropolitan Abattoir Area.—At eighteen abattoirs and bacon factories outside the Metropolitan Abattoir Area, meat inspectors inspected meat for local district consumption as well as for consignment to Sydney. One small bacon factory closed down during the year.

Departmental inspections commenced at the North West Abattoir, Inverell. There, inspection was formerly undertaken by MacIntyre Shire Council.

The number of cattle inspected at country abattoirs decreased sharply, but there was a very substantial increase in sheep inspected. Variations in the number of stock inspected, compared with the year 1958-59 were: cattle, — 30.3 per cent; calves (excluding heavy vealers), — 17.6 per cent; pigs, — 7.5 per cent; sheep, + 67.8 per cent.

Tabulated Results of Stock Inspected.—The total number of stock inspected by State Meat Inspectors; the conditions for which carcasses were condemned; and portions of carcasses condemned as unfit for human consumption; are represented in the following three tables:—

Totals of Stock Inspected

Place of Slaughter	Type of Stock			
	Cattle	Calves	Pigs	Sheep
State Abattoir	183,355	96,301	91,210	2,999,796
Licensed works within Metropolitan Area	50,237	5,399	13,756	1,370,151
Licensed works outside Metropolitan Area	284,724	267,713	306,479	1,341,553
Totals	518,316	369,413	411,445	5,711,500

Carcass Condemnation Conditions

Disease	Cattle		Calves		Pigs		Sheep	
	No.	Per cent. of kill	No.	Per cent. of kill	No.	Per cent. of kill	No.	Per cent. of kill
Actinomycosis and Actinobacillosis	8	·002	..	..	..	..	..	..
Arthritis	38	·007	35	·009	916	·223	2,537	·004
Caseous Lymphadenitis	..	..	..	..	..	..	2,197	·039
Cysticercus Ovis	..	..	..	..	..	..	175	·003
Emaciation	293	·057	36	·010	36	·009	21,774	·381
Sarcosporidiosis	..	..	..	..	..	..	520	·009
Septic Conditions	321	·062	172	·047	2,416	·587	397	·007
Tuberculosis	2,329	·449	60	·015	597	·145	..	..
Other Conditions	661	·127	909	·246	811	·197	6,537	·115
Totals	3,650	·704	1,210	·327	4,776	1·151	34,137	·598

Partial Condemnations

Disease	Cattle		Calves		Pigs		Sheep	
	No.	Per cent. of kill	No.	Per cent. of kill	No.	Per cent. of kill	No.	Per cent. of kill
Actinomycosis and Actinobacillosis	10,999	2·122	6	·002	..	..	..	..
Arthritis	978	·189	15	·004	2,793	·673	5,542	·097
Caseous Lymphadenitis	..	..	..	..	..	..	13,102	·229
Septic Conditions	173	·033	8	·002	975	·237	493	·009
Tuberculosis	2,835	·547	6	·002	2,571	·625	..	..
Other Conditions	3,000	·579	33	·009	14,488	3·521	6,101	·107
Totals	17,985	3·470	68	·019	20,824	5·061	25,238	·442

Details of Meat Introduced into the Metropolitan Abattoir Area—Details of meat introduced into the Metropolitan Abattoir Area and of condemnations made on the re-inspection of meat introduced, are shown in the following two tables. Condemnations on re-inspection were generally due to putrefaction or contamination.

Meat Introduced Into The Metropolitan Abattoir Area

Type of Meat	Origin		Total
	New South Wales	Outside New South Wales	
Beef carcasses	287,250	42,265	329,515
Beef piecemeats	1,677,486 lb.	1,273,302 lb.	2,950,788 lb.
Veal carcasses	277,171	64,343	341,514
Veal piecemeats	123,814 lb.	346,456 lb.	470,279 lb.
Pork carcasses	240,406	29,251	269,657
Pork piecemeats	825,705 lb.	2,073,557 lb.	2,899,262 lb.
Bacon sides	9,630	3,739	13,369
Bacon piecemeats	666,364 lb.	815,448 lb.	1,481,812 lb.
Mutton carcasses	1,795,939	3,467	1,799,406
Mutton piecemeats	2,234,352 lb.	1,287,167 lb.	3,521,519 lb.
Goat carcasses	17,711		17,711
Sundries	7,705,833 lb.	452,132 lb.	8,157,965 lb.

Of Meat Condemned On Re-inspection

Beef	Veal	Pork and Bacon	Mutton and Lamb	Sundries
1 carcass	5 carcasses	5½ carcasses	176½ carcasses	30,649 prs. rabbits.
1 rump and loin	4 quarters	19 legs	98 forequarters	.....
12 butts .....	.....	572 middles	15 legs	7,133 lb. smallgoods.
2 forequarters .....	.....	63 hams	6 saddles	.....
1 rump .....	.....	12 shoulders	1 trunk	.....
110 lb. tails .....	.....	7 flitches	2,772 brains	.....
482 lb. livers .....	.....	11 heads	650 kidneys	.....
2,056 lb. boneless .....	.....	160 lb. livers	188 hearts	.....
			549 lb. livers	.....

Suspect Cattle—The numbers (not including positive reactors to the tuberculin test) of cattle subject to a special post mortem examination at the State Abattoir, as suspected of being diseased, were as follow: consigned to Flemington saleyards, 463; consigned direct to the State Abattoir, 265; detected on inspection at Flemington saleyards, 505; and on ante-mortem inspection at the State Abattoir, 231; total 1,464.

Details of the diseases found on post-mortem examination of suspect cattle are given in the following table:—

Post-mortem Findings on Suspect Cattle

Disease	Consigned as Suspect	Detected Ante-Mortem	Total
Actinobacillosis	160	217	377
Actinomycosis	227	167	394
Abscess	76	128	204
Cancer	174	98	272
Injury	36	68	104
Tuberculosis	5	10	15
Miscellaneous	41	36	77
No visible lesions	9	12	21
Total	728	736	1,464

Tuberculosis Reactors—The number of positive reacting cattle to the tuberculin test, and the location of lesions of tuberculosis, found on post-mortem, are set out in the following table:—

T.B. Reactors, and Sites of Lesions

Site of Lesions	Number of Reactor Cattle	Per cent. of Cattle
Head	226	10.7
Lung	387	18.4
Intestinal tract	342	16.3
Carcass lymph nodes	48	2.3
More than one site	585	27.8
Totally condemned	283	13.4
No visible lesions	233	11.1
Reactors slaughtered	2,104	100

The number of cattle and pig carcasses condemned on account of tuberculosis has continued to decline. Condemnations of cattle and pigs by State meat inspectors on account of tuberculosis over the past eight years are set out in the following table:—

Declining Tuberculosis Condemnations (Eight Years' Figures)

Year	Cattle		Pigs	
	Number Condemned	Per cent. of kill	Number Condemned	Per cent. of kill
1952-53	4,396	0·84	3,074	0·87
1953-54	4,841	0·87	2,387	0·64
1954-55	5,000	0·87	2,714	0·58
1955-56	4,099	0·72	2,302	0·52
1956-57	4,310	0·77	1,775	0·44
1957-58	4,916	0·81	1,459	0·32
1958-59	4,971	0·56	907	0·21
1959-60	2,329	0·45	597	0·15

Liver Condemnations—The conditions for which representative samples of cattle and sheep livers were condemned at the State Abattoir are set out in the following two tables:—

Cattle Liver Condemnations (19,100 in sample)

Disease	Number Condemned	Per cent. of Sample	Per cent. of Condemnations
Liver fluke	3,800	19·9	74·9
Hydatid	589	3·1	11·6
Abscess	198	1·5	5·9
Telangiectasis	258	1·43	5·1
Other conditions	127	0·7	2·5
Totals	5,072	26·5	100

Sheep Liver Condemnations (40,000 in sample)

Disease	Number Condemned	Per cent. of Sample	Per cent. of Condemnations
Liver fluke	3,394	8·5	40·8
Hydatid	2,381	6·0	28·6
Cysticercus tenuicollis	1,316	3·3	15·8
Caseous Lymphadenitis	737	1·8	8·9
Melanosis	179	0·4	2·1
Other Conditions	320	0·8	3·8
Totals	8,327	20·8	100

QUEENSLAND BORDER CONTROL

Stanthorpe Section

Stock Movements.—Stock traffic has not been heavy; whether for re-stocking or for local abattoirs.

Stock movements to Queensland, apart from fat sheep and lambs, have been light; practically restricted to flock rams and herd bulls. Normal totals of fat sheep and lambs have moved from New England areas to Cannon Hill Saleyards, Brisbane.

Stock figures within the period as regards this section are as set out hereunder: from Queensland to N.S.W.—138,598 head of cattle, 9,771 sheep, 41,382 swine, and 2,320 horses; from N.S.W. to Queensland—3,809 cattle, 92,410 sheep, and 354 horses. Dip revenues totalled £3,209.

Increased Importance of Stanthorpe Dip.—Tick Quarantine areas adjacent to Stanthorpe and The Summit dips have recently been released from Quarantine. Since many stock dealers live in this locality and, furthermore, it gives direct access to Tenterfield sales and trucking yards, Stanthorpe Dip is now likely to be used more extensively for final crossing treatments.

Fencing.—The 28 miles of new border fencing under reference in last year's Report has been completed. This is in the Cullendore to Bald Rock sector. In the Cottonvale-Thulimbah sector a contract was let for 236 chains of barbed wire fence and was satisfactorily completed. The contract for 2 miles of new four barbed wire fencing in the Donnybrook-Limestone

sector, and transfer of existing rabbit and dog netting from the old to the new fence, was satisfied. It cost £1,200 per mile because of the roughness of country and difficulties of access.

Dips.—Stanthorpe Cattle Dip and the Summit Sheep Dip have recently been taken over again from the Board of Tick Control administration. The Cattle Dip requires some repair. The Sheep Dip is in good order.

Buildings and Maintenance.—Necessary maintenance and/or repairs have been done in respect of the following cottages, Wallangarra (2), Stanthorpe (2), Maryland (2) and Thulimbah (1).

Goondiwindi Section

Stock Movements.—Compared with the previous year, less cattle entered this State from Queensland but there was a marked upward trend in sheep movements both to and from New South Wales. Another feature was the decline in so far as fat stock were concerned. Stock were generally in good condition, surprisingly so in view of the dry conditions.

No reports have been received of incidence of P.P.C. in cattle introduced into this State from Queensland during the year; but an outbreak in the Millmerran district early in 1960 caused some concern. However, Queensland authorities have reported there is no further danger from this particular outbreak.

The statistics of stock movements to and from this State for the year are as follow: from Queensland to N.S.W.—13,553 fat and 88,800 store cattle, 13,325 fat and 203,729 store sheep, 138 fat and 175 store swine, and 3,853 horses; from N.S.W. to Queensland—9,488 fat and 17,297 store cattle, 123,184 fat and 325,455 store sheep, 42 fat and 154 store swine, and 81 horses. Dip revenues totalled £653.

Dips and Dipping.—Dips and yards were maintained in good condition. Most of the repairs were of a minor nature.

Marked variations in the analyses of samples from the four dips within the section caused some concern; particularly in the first six months of the year, and on occasions where samples were taken after hand-stirring. Every endeavour was made to rectify this matter. In the latter six months, samples have shown a more even analysis.

A new pumping plant was installed at Goondiwindi Dip. The new supply tank provided at Keetah Dip will hold an adequate reserve supply of water should the dipping increase at that Crossing.

At the four Dips in the Goondiwindi section 12,639 head of cattle and calves, 823 horses and 28 sheep were dipped.

Cottages and Office Buildings.—All cottages within the Goondiwindi Section are in good repair except that Mungindi cottage is reflecting aee. With the completion of a new cottage at Keetah in September, 1959, there are now eight cottages.

Border Fences.—New portions of fence were erected from time to time during the year, and cultivated areas are still being extended east of Keetah. It is rare for stock to be depastured on the immediate river frontage on the major portion of land from Keetah east to Bonshaw. New fences are still required on a good deal of the length of the section; but landholders very often effect repairs to old fences, where a new fence would be a more economical proposition.

A new weir is in the course of construction at Boronga Crossing. When it is completed, stock will not be able to cross the river at that point.

West of Mungindi Section

Trend to Motor Transport.—In this section there has been a marked swing to motor transport as a means of shifting stock. This has been helped by dry seasonal conditions, with little stock feed on most routes in this area.

Drovers, stock agents, and owners have co-operated well with the Border inspectors and each other throughout the year.

Stock Movements.—Excluding stock crossing at Barrington, for which the figures are not available at the time of this report, the statistics of stock crossings are as follow: from Queensland to N.S.W.—14,919 head of cattle, and 97,237 stock other than cattle; from N.S.W. to Queensland—7,641 head of cattle, and 99,201 stock other than cattle.

Form 3 Issued by Part-time Inspectors.—The issue of Form 3, by part-time Boarder inspectors, for stock by transport has proved very satisfactory. In the past, stock would at times cross the border in daylight hours but would be in the dark by the time they reached a point where a Permit Form 3 could be obtained. This gave rise to delay until next day.

Permit 181 Causing Some Trouble.—Issue of Permit 181 is still causing a certain amount of disruption. The areas are so large and long distances have to be travelled for inspections before issue of this paper. Stock invariably arrive at the border crossings without the permit.

Brewarrina Aboriginal Station.—The Aboriginal Station at Brewarrina has been inspected twice this year. No farming is being done, and there is not any stock.

BOARD OF TICK CONTROL

Continuation of Eradication in Areas West of the Richmond Range

Eradication measures were continued in the following areas west of the Richmond Range:—

Boonoo Boonoo Quarantine Area.—This was under a policy of surveillance from 1st July, 1959, to 31st May, 1960. Some 38,460 head of cattle were examined. No evidence of cattle tick was detected. In this light, the area was released from quarantine as from 31st May, 1960.

Legume Area.—This underwent further intensive examinations, at twenty-one-day intervals, from 1st October, 1959, to 31st May, 1960. Some 75,900 head of cattle were examined. No evidence of cattle tick was observed. Action was taken to release the area from quarantine as from 31st May, 1960.

Northern Cheviot Area.—This was kept free of stock for fifteen months to 31st October, 1959. Subsequently, part of the area was restocked; and all cattle in the area were examined at twenty-one-day intervals until 31st May, 1960. No evidence of cattle tick was detected. The area was released from quarantine as from 31st May, 1960.

Rivertree Quarantine Area.—The known infested portion of the Rivertree Area was incorporated within the Tabulam and Bonalbo Areas. Subsequently, examinations were carried out in the Rivertree Area from October, 1959, to the end of May, 1960. No evidence of cattle tick was observed, but further examinations will be necessary throughout the year 1960-61.

Examinations in Grafton Area

Examination of all moving stock and the treatment of cattle within the Special Areas of Clarenza and Southgate were maintained. Staff reduction occurred at the end of September, 1959. It was not then possible to implement a policy of examinations throughout the whole of the Grafton Area as had been planned; but the funds position at the end of February, 1960, made it possible to employ additional staff for this work.

Throughout the whole of the Grafton Area, with the exception of the two special areas, Clarenza and Southgate, twenty-one-day examinations were put into operation in March and continued until 30th June, 1960. During the year, 394,389 head of stock were examined in the Grafton Area. No evidence of cattle tick was detected.

In view of the very satisfactory position, the advisability of re-establishing the Copmanhurst-Grafton boundary was considered. It had been eliminated in September, 1959, owing to the staff reduction.

The boundary was re-established on 27th June, 1960, and restrictions were imposed on introduction of stock into Grafton Area from Copmanhurst Area. Stock were only allowed to enter Grafton Area subject to three treatments as required for movement to clean country.

Detection of Arsenic Resistant Ticks

Additional properties within the Richmond and Tweed Quarantine Areas came under notice for apparent failure of arsenic. Investigations by veterinary officers and other staff confirmed the suspicion of arsenic resistance in many cases. Where necessary, more dips were charged with DDT, for treatments on holdings concerned. The following are details of the developments:—

Casino Section of Richmond Quarantine Area.—Thirty-one holdings were involved. Most were in the areas west of Casino, and in the Dobies Bight, Dyraaba, Doubtful Creek, Piora and Woodview localities. Additional, isolated holdings were involved at Springrove (1), Bentley (1), Backmede (1), and Yorklea (1).

Rappville Section.—One holding became involved at Ellangowan; the result of movement of stock from the Dyraaba Area.

Nimbin Section.—Nine holdings were involved. These were at Rock Valley (2), Wongavale (2), Larnook (1), Cawongla (1), Nimbin (1), and Stoney Chute (2).

Lismore Section.—Seven holdings were investigated in this section. Five were at Leicester Creek. The other two were at Boatharbour and Rock Valley.

Tweed Quarantine Area.—Six holdings were investigated. These were scattered over the Tweed Area, as follow: Highfields (3), Stokers Siding (1), Round Mountain (1) and Terragon (1).

Tick Fever Outbreaks

Cawongla (Nimbin Section of Richmond Quarantine Area).—During June, 1959, a mortality was investigated on a grazing property running about 360 head. Four deaths occurred in about one month. Even with smears it was not possible to confirm tick fever in any of these cases. However, early in July, 1959, blood samples collected from seven head of cattle which had shown some evidence of fever and ill-health were inoculated into splenectomised calves at Glenfield Veterinary Research Station. Positive results were obtained. *Babesiella argentinum* was identified in smears from the calves that reacted.

The usual control measures were put into operation. No further case was detected. The recovered animals were consigned to the abattoirs for slaughter.

Origin of this outbreak could not be traced, though there had been many introduction onto the holding from various sources in the preceding twelve months.

Doubtful Creek (Casino Section).—In August, 1959, a veterinary practitioner suspected tick fever in a cow on a dairy farm at Doubtful Creek. Glenfield Veterinary Research Station confirmed the presence of *Babesiella argentinum* in the smears. Total mortality was three head. No further case developed after control measures commenced. Origin of the outbreak could not be traced.

Yorklea (Casino Section).—In December, 1959, a further case was diagnosed by the same veterinary practitioner when investigating a mortality in a herd of 133 beef cattle. Smears from two animals confirmed the presence of *Babesiella argentinum*. Control measures were instituted. No further death occurred. However, the tick infestation was not eliminated with the usual arsenic treatments. Action was taken to charge the necessary dip with DDT. Origin of the tick fever could not be traced.

Tweed Quarantine Area.—In February, 1960, death of a cow in a herd of sixty-two head at Banora Point was investigated. Post mortem suspicion of tick fever was confirmed. Smears revealed *Babesiella argentinum*.

In this outbreak there had been only one recent introduction onto the property. This was a bull purchased from another stockowner at Tweed Heads. To trace the origin of the outbreak a blood sample from the bull was put into a splenectomised calf. The calf reacted. The few remaining animals on the property from which the bull originated were then tested. No positive reactor was obtained. Between time of sale of the bull and testing the herd some animals had been disposed of for slaughter. Some of these might have been reactors.

Alterations in Policies East and West of the Richmond Range

Richmond, Tweed and Kyogle Quarantine Areas.—After the staff reduction at the end of September, 1959, there were only enough men in these areas for a very modified control policy. They maintained the dips and as far as possible supervised the treatment of all dry stock at twenty-eight-day intervals from 1st November to the 30th June, 1960. Dairy herds were inspected, where possible; and necessary supervision was given to treatment of infested cattle, control of arsenic resistance, and tick fever holdings.

Considerable stock were treated in the period, but the number of infestations detected or reported was high in all areas except Kyogle. Had full staff been available the recorded number of infestations may have been greater. The following figures index the position over the last three years:—

Area	Infestations Recorded		
	1957-58	1958-59	1959-60
Bangalow	186	167	78
Lismore	157	150	65
Nimbin	126	182	62
Casino	178	169	111
Rappville	269	133	19
Kyogle	248	194	69
Tweed			

No substantial improvement is likely until a policy of full control is put into operation, including control over all moving stock.

Areas West of the Richmond Range.—A full control policy operated in the Woodenbong, Bonalbo, Tabulam and Copmanhurst Areas from 1st January to 30th May, 1960. In this period all stock were treated five times at intervals of twenty-eight-days, with the exception of dairy herds and a few beef herds. These were too far from the dips; they were examined at yards provided by the owners.

All moving stock were examined and dipped prior to movement; except stock proceeding to saleyards (examined prior to movement and then treated), or stock proceeding east of the Richmond Range (allowed to move if clean on examination).

Very few infestations were detected in these areas, as indicated: Copmanhurst area, 7; Woodenbong area, 2; Bonalbo area, 5; Tabulam area, 11.

Operation of Flying Gangs

Flying Gangs comprising two senior assistants and twenty-six assistants operated in clean country south of Grafton and Copmanhurst from September, 1959, to the end of May, 1960. They covered a large area, extending as far south as Urunga and as far west as Newton Boyd. Some 208,900 head were examined.

No evidence of cattle tick was detected. Large numbers of ticks were submitted for identification. Only *Haemaphysalis* and *Ixodes* species were found.

In addition, one man was stationed at Macksville Abattoirs and one at Tenterfield Abattoirs. Examination of all stock killed at these centres failed to reveal any evidence of cattle tick.

Compensation Claims

In the twelve months claims for compensation for loss of 125 head of stock by death or injury were paid. The amount involved was £2,960.

Fencing

The quarantine boundaries were maintained and improved. The jobs were spread over the Tweed, Tabulam, Copmanhurst, Woodenbong, Bonalbo, Grafton, and Boonoo Boonoo Areas.

In all, 50 miles of new fencing and repairs to 40 miles of existing fences were achieved.

Dip Construction

The Dip Maintenance Gang constructed four new dips: one in Nimbin Area, to replace a collapsed dip; one in Bonalbo Area, to provide dipping facilities for a property not previously provided for; and two dips in Grafton Area, one on the southern boundary near Mallara, to provide dipping for stock going to clean country, and the other at South Grafton Saleyards.

The Gang was active, also, on repairs to dips and dip yards in the Grafton-Copmanhurst Areas.

Some ninety dips were placed in operation in the Copmanhurst Area between July, 1958, and 1st January, 1960.

Staff

The Board of Tick Control commenced the financial year with a field staff of 730. Early in the year, however, the establishment had to be reduced by 180 because of the funds position. Most of the retrenchments were effected on 1st October, 1959.

An additional grant of £23,000 early in March, 1960, made it possible to increase the staff by fifty-seven. Most of these men were drawn from those previously retrenched. In fact, all retrenched men whose services had been satisfactory and who so desired were reappointed.

After the release of Boonoo Boonoo Area from quarantine, fourteen Public Service Board appointees and twelve Ministerial employees were transferred from the Board of Tick Control establishment to the Inspector of Stock, Queensland Border (Stanthorpe Section).

At the close of the financial year the Board's field staff totalled 567.

Research—Laboratory of Board of Tick Control

Deposits of DDT on Hair of Cattle.—The laboratory undertook some work towards finding the half-life of deposits of DDT on hair of dipped cattle. The graphs indicated that the half-lives varied between 5 and 8.5 days.

Various anomalies were observed. Further work will be done; on the hair-deposits where the dips have been charged with hardwater rucide, and other rucide dips charged with a pre-mix technique—also involving hardwaters.

Head-wetting.—Further work was undertaken. A fluorescent dye, added to the dip, gave encouraging preliminary tests. Unfortunately, whilst the fluorescence was plainly visible on white parts of the animals, the fawn-coloured areas did not show sufficiently to make satisfactory observations. This work will be followed up.

Settling-Rate Tests.—Trials were made in connection with the settling-rates of two DDT (Timbrol's) dips. The rate of settling was very low as compared with rucide. In the cases of the two dips tested, they could be allowed to rest for at least two hours with complete safety.

Further observations were made on the settling-rate of a dip charged with a rucide prepared for use in hard waters. In this case, even after standing for two hours, the concentration of DDT was considerably higher than in the ordinary rucide dips.

Depletion of Isomers of BHC.—Observations were made on some forty DDT-BHC dips over the twelve months. Some 500 samples were tested. They indicated no serious depletion of gamma isomers, based on the relationship of the gamma isomers to total isomers. Further work is being undertaken.

Care and Maintenance of DDT and BHC Dips.—The suggestion that a dip could be allowed to settle, and then scooped with the view to eliminating the greater part of the mud without loss of DDT, was investigated. The Laboratory work proved that this was not practicable. Serious loss of DDT was likely to occur. Amounts of DDT in the samples examined varied from 2.7 to 7.6 per cent.

Total loss of DDT from a dip scooped in this manner might vary from about one and a half to four drums (each drum weighing 56 lb.).

Toxicology of DDT and BHC.—Very little work was done on this. Some specimens have been examined from animals which had died after spraying with BHC (lindane) or dipping in DDT-BHC. In the former, a number of calves were sprayed with lindane (20 per cent gamma isomer) at 0.125 per cent. Symptoms were apparent in a few hours, and death occurred in twenty-four hours. Specimens of brains from these animals showed 20 mgm. per kgm. of BHC.

In a few other cases of suspected poisoning, following dipping, specimens showed the presence of BHC in various organs, but no significant symptom had been noted before death.

The laboratory also completed the analyses of specimens submitted from various trials carried out at Glenfield Veterinary Research Station.

Further work is essential, to determine the critical level of DDT and BHC in the various organs.

Toxicology of Arsenic.—Eighty-four specimens were analysed for arsenic. In thirty-four, it was possible to indicate that the animals had died of arsenical poisoning; in thirty-three, death was not due to arsenic; in the remaining seventeen deaths, the cause was doubtful.

Some work was done towards producing a more accurate graph relating the amount of arsenic contained in the viscera of poisoned animals, and non-poisoned animals, with the time elapsed after death. Inferences drawn from this work suggested that:—

- (i) When visceral analysis is considered, bovines eliminate arsenic at a fairly constant rate for the first ten to twelve days. This rate represents approximately one-fifth of the arsenic present on any one day and is independent of the initial amount.
- (ii) Normal amounts of arsenic are reached at from nine to twelve days; so analytical results at such an interval after dipping very often have little toxicological significance.
- (iii) When the samples are collected from animals one day after dipping, and analysed for arsenic, there is only a small margin between non-poisoned animals and those poisoned by percutaneous absorption.

Complement Fixation Test for Tick Fever.—C.S.I.R.O. workers at Yeerongpilly have developed a complement fixation test for tick fever, and already some specimens have been submitted from within the Tick Quarantine Areas for tests at Yeerongpilly. The results to date have been inconclusive.

Within a short period the difficulties being experienced at Yeerongpilly may be overcome. The test would then provide a definite means of detecting carriers in herds involved with tick fever outbreaks.

DIVISION OF SCIENCE SERVICES

Biology Branch

PLANT PATHOLOGY SECTION

New Plant Disease Records

Sixty-two new plant diseases were recorded in New South Wales. Of particular interest were leaf blight (*Heterosporium allii*) of onion, causing leaf withering of onion seedlings; pod twist (*Pseudomonas flectens*) of French beans, which has probably been present for many years and confused with thrips injury; black-dot root rot (*Colletotrichum coccodes*) of tomato; and flower blight (*Ovulinia azaleae*) of azalea. Other new records included the clarification of species of Meloidogyne present on several plants known for many years to be susceptible to root knot. Several of the new diseases were in native plants.

The check-list of plant diseases recorded in New South Wales is being completely revised.

Cereal Diseases

Wheat Diseases.—The 1959 winter and early spring were dry, but late rains ensured better than average yields. Because of the dry conditions wheat diseases were far less important than in the previous season.

Frost caused serious damage only in isolated cases; and, in contrast to 1958, serious rust damage was present only in a few late sown crops.

The rust picture was interesting, however, in that a new race of stem rust capable of attacking Glenwari was identified on collections examined at Sydney University.

Of the smut diseases, bunt (*Tilletia foetida* and *T. caries*), although rare, was observed in more grain deliveries than usual, particularly from the central west. In cases investigated, the crops had been grown from untreated seed. Flat smut (*Urocystis tritici*) was again observed in Gabo, the only susceptible variety recommended for sowing in New South Wales. A 150-acre crop of Gabo at Dubbo was almost ruined.

Foot-rots and take-all were widespread, particularly in crops following pasture. An Australia-wide conference was held at Wagga Agricultural College in April, 1960. In consequence, there will be a more intensive attack on this perennial problem.

The yellow-dwarf virus disease of wheat was again observed in the south-west.

Maize Diseases.—Stem- and cob-rots (*Fusarium* spp. and *Diplodia zeae*) and leaf blight (*Helminthosporium turcicum*) continued to be the main causes of loss. They were favoured by the long, moist summer. There is considerable variation in susceptibility amongst the varieties and hybrids, and losses should be reduced in the future by the use of suitable hybrids.

A severe, yield-reducing outbreak of leaf blight occurred in central coast sweet corn crops grown for canning. The unusually warm and moist spring and early summer favoured early outbreak of the disease, whereas the canning crops in these areas have usually been harvested before the disease becomes damaging.

Trials at Kempsey and Comboyne tested the relative resistance of hybrids to head smut (*Sphacelotheca reiliana*). Field observations had suggested that certain varieties might be particularly susceptible. Results of these initial trials have confirmed the field observations. Unless hybrids are screened for resistance, this disease could become troublesome.

Sorghum Diseases.—Charcoal rot (*Macrophomina phaseoli*) occurred as usual in inland areas. This disease is favoured by dry conditions, with the plants growing under stress, and by high soil temperatures.

Rice Diseases.—Parasitic diseases of rice do not occur in the Murrumbidgee Irrigation Areas; but some concern was expressed over a sheath rot at water level and a scorching of the outer leaves, observed in two crops. No evidence of any parasite could be found. It was diagnosed as heat damage due to the January heat wave. The crops subsequently recovered.

A similar condition was noted in 1958 in specimens from the Northern Territory.

Diseases of Pasture Plants and Field Crops

Diseases of Grasses.—Ergot (*Claviceps phalaridis*), a troublesome contaminant of samples of *Phalaris* seed harvested in the south-west, was observed in the field for the first time. Infected plants had a different vegetative appearance to the uninfected. In their heads all spikelets were affected, most unusual for an ergot.

Clover Diseases.—Numerous diseases were recorded, as usual. Most of them were unimportant. A very heavy infection of the virus disease, stunt, was observed late in the season on subterranean clover. Whole paddocks had turned red and become stunted. However, most paddocks had provided good grazing in the winter and early spring. The actual loss of feed was very small.

Burn (*Pseudoplea trifolii*) was again severe on white clover in the Taree district, and root knot (*Meloidogyne* sp.) was observed in several north-coast areas.

Lucerne Diseases.—Crown rots, favoured by the moist summer, were unusually prevalent, and associated with poor regrowth after grazing.

The unusual forked-root condition, which occurs in trials to establish lucerne on the north coast, has been investigated. No pathogen has been found in the affected roots. The soils are to be examined for nematodes and other possible parasites during the coming season.

Cotton Diseases.—Bacterial blight (*Xanthomonas malvacearum*) was again present at Narrabri Experiment Farm. It was also recorded in the Murray River districts. Wilt (*Verticillium dahliae*) again occurred at Narrabri. It was the only disease observed there in the quarantine area. Over 100 varieties, the seed having been examined and treated at the Biology Branch, were grown. It was considered soil-borne, and not introduced with the seed.

Tobacco Diseases.—Several problems have been investigated. They have arisen in the general breeding programme for a commercial tobacco line resistant to blue mould (*Peronospora tabacina*).

A symptom associated with systemic infection is a dark discolouration of the vascular system at the base of the stem. Many workers have accepted this as the criterion of systemic infection; but investigation has shown that the discolouration may be associated with a resistance mechanism and may not be a symptom of systemic infection.

Examination of the breeding material has suggested that several different types of resistance occur; including hypersensitivity, resistance required a short time after infection, and tolerance. The possibility that these resistances are of chemical nature is being examined, and the factors affecting resistance are being studied. Light, temperature, age and vigour of the plant, and nutrient level of the soil all appear to be important.

Root-knot resistance is also being studied, in conjunction with the breeding programme; since root-knot nematodes are a serious problem in all tobacco growing areas of Australia and the only present method of control is fumigation of seed-bed and field soils.

Diseases of Vegetable Crops

Potato Seed Certification.—For the fifth successive season, no potato crop submitted for certification in the tableland areas of New South Wales was rejected because of excess leaf roll content; an extremely satisfactory position. No crop submitted for certification in this 1959-60 season was rejected for any virus disease infection.

Late Blight (*Phytophthora infestans*) of *Potato*.—Late blight, favoured by continued wet weather, caused moderate to severe losses in late winter and spring crops on the far north coast, the central coast and in the Sydney metropolitan area; including a 25 per cent loss of the Windsor-Richmond crop. The tableland maincrop and the coastal autumn crop were free of late blight.

Race 4 of *P. infestans* (International Classification) was detected for the first time in New South Wales, on potato at Warriewood.

The natural occurrence of this race could not be explained on the basis of the field culture of *R.* genotypes in the locality. It would appear race 0 had mutated, and acquired the race 4 character. The field occurrence of race 4 on potato varieties lacking the genes for immunity derived from *Solanum demissum* has been noted in a number of countries in the last few years. Published overseas work strongly indicates that mutation from race 0 to race 4 is much more frequent than mutation of race 0 to race 1, 2 or 3.

In co-operation with Division of Plant Industry, the project for development of potato varieties immune to race 0 of *P. infestans* is being continued. This year's results showed that thirty-three agronomically promising seedlings were resistant. Of these seedlings fifteen were derived from the U.S.A. variety Cherokee, seven from the U.S.A. variety Saco, two from the U.S.A. seedling B595-76, seven from the Scottish seedling 1928 (e) 2, 1 from the Scottish seedling 885 (4), and one from the Scottish seedling 1521 (c) 3.

Rugose Mosaic of Potato (*Potato Virus X* + *Potato Virus Y*).—In 1958 the variety Walanga, bred by this Department, was no longer accepted for certification, because of its high susceptibility to and tolerance of potato virus Y. Steps have been taken to ensure that a similar situation does not arise in regard to varieties released in the future.

Field inoculation tests were done during the year on Departmental seedling No. S2680 (since released as the variety Murru). These tests showed that this new variety reacted to current season infection by potato virus Y. It produced the typical "leaf drop streak" symptom. This is most satisfactory; as current season infection would be easily detected during certification inspections, and affected plants could be rogued.

Common Scab (*Streptomyces scabies*) of *Potato*.—Work continued in co-operation with Division of Plant Industry for development of scab resistant potato varieties. Cultures of the fungus have been again supplied to the potato breeder; to test, in vermiculite culture, the reaction of seedlings derived from scab resistant parents. Some promising seedlings have been obtained from the U.S.A. scab resistant variety Cherokee, and the use of the South American variety Emilia (*Solanum andigenum*) as a parent is being continued.

Sclerotinia Rot (*Sclerotinia sclerotiorum*) of *Potato*.—This disease occasions some damage to the above ground parts of plants in crops grown on the North Coast, but it is most unusual on potato crops in other parts of the State. In the autumn of 1960, *Sclerotinia* rot caused some damage to the tops of three potato crops in the Crookwell area. Seed tubers were not affected.

Virus Disease of Tomato.—(a) **Yellow Top** (Virus): This was the predominant disease in the North Coast crop. Infections occurred from late winter. In some cases, they built up to 100 per cent. The epiphytotic continued over the spring and summer months. It was largely responsible for the small supply of tomatoes available in that area. The disease continued to be active in the autumn crop, when infections up to 90 per cent. were recorded. Incidence of yellow top in crops in the Central Coast and metropolitan area was generally low, but there were individual cases of 20 per cent. infection.

Investigational work on this disease has been intensified. Further information on its nature and control will be published shortly.

(b) **Drop Head Wilt** (Virus): Incidence remains at a fairly constant level in glasshouses in the Warriewood-Mona Vale district. A technical note describing the virus and indicating its relationship with the tobacco mosaic virus complex is in press.

(c) **Leaf Shivel** (Potato Virus Y—leaf shrivelling strain) and **Yellow Leaf Shivel** (Potato Virus Y—leaf shrivelling strain plus tobacco mosaic virus—aucuba strain): Both were recorded for the first time in this State during the year, in north coast crops. They have been known in Queensland for some years.

Leaf Shivel occurred on the North Coast in late winter and spring. Infections of 50 per cent. were common, and one 100 per cent. infection was recorded. Yellow Leaf Shivel was found in a crop at Duranbah in September.

(d) **Tobacco Mosaic** (Virus).—This was unusually prevalent in outdoor tomato crops in the Sydney metropolitan area in the summer and autumn. Fifty per cent. infections were common. One instance of 100 per cent. was recorded.

(e) **Spotted Wilt** (Virus).—An epiphytotic of this disease occurred in tomatoes in the Murrumbidgee Irrigation Areas in summer. Infection reached 100 per cent. in some crops. The most severely-affected crops were those which had received the least protective spraying with D.D.T.

Fungus Wilts of the Tomato.—Cultures of *Fusarium oxysporum* f. *lycopersici* and *Verticillium dahliae* were prepared and supplied to the Division of Plant Industry for its programme of breeding tomatoes resistant to these pathogens. As was the case last year, *Fusarium* wilt was again prevalent in crops of the Grosse Lisse variety in the Sydney metropolitan area.

Cauliflower Mosaic (Virus).—In August, 1959, this was recorded for the first time in New South Wales, on cauliflowers in Fairfield West-St. John's Park area. It was in ten crops of the varieties Deepheart and Metropole. The level of infection varied from one or two to 60-70 per cent. of the crop.

The aphid *Myzus persicae*, a vector of the virus, was found in all ten crops. It had doubtless introduced the virus, which is not seed-borne. The infection could be present in crucifer crops at any time of the year under the system of vegetable growing practised in the area. Examination of many cruciferous weeds in the locality did not indicate that these weeds at the time were infected with the virus. It is confined in its host range to plants of the botanical family *Cruciferae*.

The other economically important virus disease of crucifers, the cabbage black ringspot virus, first detected in this State in 1957 at Dundas, on cauliflower, cabbage and broccoli, was also found on cabbage at Fairfield West in August, 1959.

Bean Seed Certification Scheme.—The Bean Seed Certification Scheme was in its 17th successive season. Again comparatively few crops were planted, because of the large amount of bean seed available. Of 41 crops inspected, 28 were certified, and three were approved for growing for certification next season. Of the 10 crops not certified, two were rejected because of halo blight, and one because of anthracnose, four were picked for green beans, one was destroyed by rain and two had excessive weed growth.

Bean Diseases.—Work on disease resistance continued. Several promising selections were made from 96 cross-bred lines grown in the field. Several of the introduced commercial varieties and wild *Phaseolus vulgaris* lines found to be resistant to anthracnose (*Colletotrichum lindemuthianum*) in glass-house inoculation tests were also field tested. Many of them are good, high-yielding types and will be of value in breeding.

The wild *Ph. vulgaris* line No. 345 is especially promising for use in breeding for disease-resistance. It is completely resistant to anthracnose; and has not shown any sign of rust nor common blight when grown in the field amongst heavily-infected varieties. It is a high-yielding dwarf bean; with purple, navy-type pods. Using it as the pollen parent, a few crosses with Hawkesbury Wonder were made this year.

Bean rust (*Uromyces appendiculatus*) was unusually severe in coastal beans. The spring weather favoured the rust epidemic. In contrast, autumn crops, usually worst affected, were only mildly attacked, because of very dry conditions during late summer and the autumn.

Lettuce Big Vein.—Survey showed that this disease is more common in N.S.W. than previously thought. Root examinations revealed relationship between presence of the fungus *Olpidium brassicae* in the roots and big vein symptoms in the leaves. This agrees with recent overseas findings. An attempt to control big vein, by trying to control *Olpidium* with soil treatments, was not successful.

Pea Diseases.—Investigations on the stem, leaf and pod disease caused by the fungus *Mycosphaerella pinodes* were continued. The importance of pea trash in the carry-over of this disease was seen in a trial plot at Camden. Self-sown plants came up in the autumn in the residue of the previous spring's diseased crop which had been chopped up but not ploughed in. They were heavily infected by ascospores arising from the diseased trash.

To see if any resistance to this disease could be obtained, 158 lines of pea varieties and other *Pisum* spp., obtained mainly from the C.S.I.R.O., were grown in the field during the winter and spring of 1959. Severe infection occurred in all lines tested.

Powdery Mildew (*Oidium* sp.) of Rockmelon.—Last year's report recorded that resistance of the rockmelon variety P.M.R. 45 had broken down in the Murrumbidgee Irrigation Areas and in the Lower Murray Area. This season the varieties P.M.R. 5, P.M.R. 6 and Edisto, and a number of F₁ seedlings derived from P.M.R. 5 and P.M.R. 6 were all susceptible to powdery mildew in the Lower Murray Area. It had been hoped that they would provide a source of resistance following the breakdown of P.M.R. 45. Now, because of its overall agronomic superiority, P.M.R. 45 would be preferable to P.M.R. 5 or 6 as a parent in the rockmelon breeding programme; until a source of resistance to the disease is found.

The perfect stage of the powdery mildew attacking these varieties has not been found, but the oidial stage corresponds in many features to that of *Sphaerotheca fuliginea*. P.M.R. 45 and P.M.R. 5 and 6 were bred in the United States for resistance to races 1 and 2 respectively of *Erysiphe cichoracearum*. If *E. cichoracearum* is the common rockmelon powdery mildew in that country then no resistance to *S. fuliginea* would be expected in these varieties. The fact that P.M.R. 45 has been resistant to powdery mildew for over 20 years in New South Wales could possibly indicate a recent invasion by *S. fuliginea*. Enquiries are being made of workers in Asian countries where *S. fuliginea* is known to be present, as to possible sources of resistance in rockmelons.

Fusarium Wilt (*F. oxysporum* f. *melonis*) of Rockmelon.—This disease continued to be destructive in early rockmelon crops in the Murrumbidgee Irrigation Areas; and was also recorded in the Lower Murray Area. There it caused moderate to heavy losses in experimental plantings of the varieties P.M.R. 5, P.M.R. 6, hybrids from these varieties, and Edisto. The variety Spartan Rock was resistant; but the small fruit produced by this variety preclude its use other than as a source of resistance in the breeding programme. Seed of the new wilt resistant variety Harvest Queen has been introduced from the United States for use in this work.

Black Rot (*Mycosphaerella melonis*) of Watermelon.—This disease, also known as Gummy Stem Blight, was recorded for the first time in this State at Castlereagh and Lower Portland. Infection approached 50 per cent. The affected variety was Candy Red (Charleston Grey). Infection usually arises from the infected debris of a previous crop; so adequate crop rotation is the main control. Fungicidal treatment of the growing crop has not controlled the stem canker stage.

Beet Nematode (*Heterodera schachtii*).—Further surveys were made, to determine the extent of beet nematode infestation of market gardens in the Sydney metropolitan area. Viable cysts were found on three properties at Matraville; and non-viable cysts on two properties at Caringbah, one property at Lansvale, and one property at Epping. No cysts were found in market gardens at Eastwood, St. Ives, Carrs Park or Lugarno.

The results of these and previous surveys, indicate that viable beet nematodes are in the old established market gardening areas of Botany, Brighton, Mascot, Matraville and Milperra. Re-zoning of these areas for industrial or domestic purposes will soon have ended their use for market gardening.

Misting Machines for Control of Vegetable Diseases.—Following successful control of banana leaf diseases by applying mineral oil through shoulder-mounted misting machines, the use of these machines in vegetable crops has been examined.

Progress results in tomato crops are summarised as follows:

(a) Injury to plants and substantial yield reduction resulted from mist application of fungicides in mineral oil.

(b) Control of early blight (*Alternaria porri* f. *solani*), under conditions conducive to a moderate attack, and of leaf spot (*Septoria lycopersici*) and leaf mould (*Cladosporium fulvum*) under conditions conducive to a severe infection, has been demonstrated. This was when the plants received the fungicides in a water mist. The efficiency of mist application against early blight under epiphytotic conditions, or against late blight (*Phytophthora infestans*), is not known.

(c) The work so far has been on trellised crops; the efficiency of mist application of fungicides in staked crops is not known.

(d) The required gallonage of mist is greater than that for bananas. Rates of from four to 30 gallons per acre, dependent on the age of the crop, are required for tomatoes. After the plants are about 18 inches high they must be misted from both sides. Only misting machines with a hand directed nozzle are suitable for tomato misting. Machines with fixed nozzles are unsuitable.

Results on cucumbers and beans also included misting oil injury. Further work will be done to determine the amounts of materials to be used and the most efficient method of application to these crops.

Mushroom Culture

The trend towards indoor mushroom culture recorded in last year's report has continued. Interest in synthetic, non-manure composts is spreading among indoor growers. Some satisfactory results from a sawdust-based medium have been reported.

Six producers of high quality mushroom spawn supply the requirements of the industry. Practically all the spawn produced is of the white strain, but there is a limited demand for the brown strain.

There was little incidence of diseases and competitors in mushroom crops. However, two outbreaks of mat disease (*Myceliophthora lutea*) were recorded. At Windsor, the disease reduced the yield of 6,000 square feet of ridge bed to $\frac{1}{4}$ lb. per square foot; at Narrabeen, mat caused a 20-30 per cent loss in one commercial crop.

Citrus Diseases

The only unusual disease development was of speckled blotch. This severely blemished maincrop Washington navel, Valencia and Joppa oranges, and also Emperor mandarins and grapefruit in some Kurrajong and Hawkesbury River orchards. This was after unseasonably hot weather in April.

Phytophthora Diseases.—A screening trial for *Phytophthora* resistance was carried out. Varieties and strains of mandarin, sweet orange, *Poncirus trifoliata* and trifoliata hybrids were used. They were planted in soil infested with *P. citrophthora* and *P. parasitica*.

All trifoliata selections showed high resistance. Of the mandarins and oranges, a scarlet mandarin selection from Moorland showed resistance to both species at a level comparable with that of Seville orange. The selection will be tried as a stock for lemons and other varieties for replanting *Phytophthora*-infested soil.

In general, the citrus selections showed slightly higher resistance to *P. parasitica* than to *P. citrophthora*.

Scalybutt (Virus).—Following an observation some years ago, that a watershoot on a scalybutt-infested Valencia orange yielded virus-free budwood, trees of Shamouti orange were cut back to induce watershoot type of growth. Budwood has taken from these for working on *Poncirus trifoliata*, and also for indexing for the presence of other viruses carried by Shamouti.

Stunting on *Poncirus trifoliata*.—In collaboration with Division of Horticulture, propagations have been made for a further series of attempts to establish the cause of non-scaling stunting on *P. trifoliata*. Budwood free of xyloporosis is being used, both for the production of experimental trees and for inoculation buds. Three heights of budding are being tried. There is evidence that height of budding may be important in determining the nature of the bud union.

Stem Pitting (Virus)—Mild Strain Protection.—In collaboration with Division of Horticulture, some seven year old grapefruit propagated from selections carrying mild strains of stem pitting, and nucellar virus-free grapefruit inoculated with mild strains, have maintained the fruit type of the parent tree. They are carrying little or no poor fruit this season. Two uninoculated originally virus-free control trees are showing moderate to fairly severe fruit distortion.

Tristeza (Virus).—Several years ago some trees of smooth Seville orange on rough lemon stock, topworked to Valencia orange, were found. These had grown well. They showed none of the tristeza symptoms which affect sweet orange growing directly on Seville orange rootstocks.

Samples of budwood or bark were taken from the Valencia, Seville orange and rough lemon sections of these trees, and were worked to indicator seedlings.

It was found that the Valencia tops and the rough lemon roots carried the severe tristeza virus, but the Seville intermediate carried only stem pitting. The bearing of this observation, on the theory of the action of tristeza virus, is being explored.

Xyloporosis (Virus).—Surveys have been continued, to find the extent of xyloporosis virus in citrus in N.S.W. and its connection with conditions of decline. Some observations have indicated an interaction between tristeza and xyloporosis viruses. Field symptoms of xyloporosis have been found on off-type Washington navel oranges, though oranges generally are stated to be symptomless carriers of this disease.

Sudden Death.—Established trees of *Poncirus trifoliata* hybrids, and a number of sweet orange, Seville orange and mandarin varieties, were inoculated with an isolate of *Coprinus* sp.

Within seven months, inoculations have produced—in parts of root tissue adjacent to any beyond the inoculated area—symptoms closely similar to the wood-browning which is diagnostic of sudden death; with well marked differences in susceptibility between varieties.

P. trifoliata strains, Carrizo citrange, Citremon and Morton citrange, and sour orange, proved to be highly susceptible; sweet orange and rough lemon only slightly susceptible; and Cleopatra mandarin nearly immune. Field observations on sudden-death incidence support this susceptibility rating.

Winter Yellowing.—Analyses by the Chemistry Branch have shown consistently lower Ca and usually slightly higher Mg, in samples of yellows-affected leaves—as compared with healthy leaves from trees of the same planting.

This gives some support to the hypothesis that yellows may be induced by foliage accumulation of organic acid, e.g. oxalic acid, due to insufficient calcium to neutralise it. Crystals of calcium oxalate are abundant in healthy foliage of citrus but appear to be much less frequent in yellows-affected leaves.

Joppa Ring Disease (Virus).—In collaboration with Division of Horticulture, this disease has been transmitted by budding to nursery trees of Nagami Cumquat on rough lemon stock. It is therefore presumed that Joppa ring disease is caused by a virus; and possibly identical with podagra disease, described in Florida and Texas as affecting bud union tissue of Cumquat on rough lemon.

Black Spot (*Guignardia citricarpa*) of Citrus.—A field trial of a number of promising new fungicidal spray materials has been undertaken in the Mangrove Mountain area. Efficiency of a number of materials will be compared with the standard recommendations for controlling black spot of the Valencia orange.

In co-operation with the Division of Horticulture, several black spot spraying trials have been undertaken in the Dooralong-Jilliby districts. Funds to initiate these trials were provided by the Wyong Co-operative Citrus Packing House. The trials are to examine the efficiency of a large number of proprietary fungicidal materials in controlling black spot under conditions (i) where the disease is easily controlled; (ii) where the disease is difficult to control. The effect of white spraying oil additives on fungicidal efficiency is also being tested.

Preliminary trials of oil-fogging applicators in relation to black spot of citrus have been undertaken; to date without satisfactory control of black spot. Further trials are in hand.

In co-operation with the Citrus Wastage Laboratory, Gosford, the efficiency of a number of post harvest dip treatments in reducing black spot development on stored Valencia fruits is under examination. Earlier work had indicated that a dip of 2 per cent. sodium ortho phenyl phenate reduced development of black spot on citrus in storage.

Etiology of Brown Spot of Emperor Mandarin.—Inoculation studies have shown that a species of *Alternaria* is highly pathogenic on young fruits, leaves and twigs of Emperor mandarin. Typical lesions of brown spot can be obtained within three days on young shoot tissues. Lesions develop on one month old fruits within 18 hours, causing fruit to drop within 48 hours. Six months old spores produced in pure culture retained their capacity to germinate and infect mandarin shoots.

The pathogenic *Alternaria* has been consistently isolated from brown spot lesions on Emperor mandarins throughout the summer. As well, this organism has been isolated into pure culture from brown spot lesions on rough lemon, Wheeny grapefruit, calamondin and various tangelo varieties. Cross inoculation studies have established the pathogenicity of these isolates to Emperor mandarin. The relationship of the brown spot *Alternaria* to *Alternaria citri* is being investigated.

Citrus Nutrition Experiments.—A long term citrus nutrition experiment in co-operation with the Division of Horticulture and the Chemist's Branch has been continued at the Gosford Experiment Station, Narara. Tree health and growth, yield of fruit, and mineral status of leaves of Valencia orange trees on trifolia stock are being studied, in relation to application of various mineral nutrients. The trees are in the open, in concrete pots of 10 cubic feet capacity. The soil is sandy loam typical of Mangrove Mountain-Somersby citrus districts.

Some interesting trends are already apparent. The level of leaf calcium is closely correlated with tree health. Trees with low calcium leaf content are very unthrifty. Factors responsible for variation in calcium absorption are being studied.

The interrelation of leaf nitrogen and potassium also appears to be very important in maintenance of normal physiological function of the plant. These aspects also are being further studied.

Diseases of Deciduous Fruits

Black Spot (*Venturia inaequalis*) of Apple.—Infection conditions were very favourable in most of the highland districts.

Apple Black Spot Eradicant Investigations.—Investigations into the control of black spot by the use of a post-harvest eradicator treatment were continued at Maroota and Tumorrana.

Three small isolated plots of trees, ranging from 16 in one group at Tumorrana to 220 at Maroota, have been treated since 1955 by the eradicator method only. Each of these three plots was severely infected at the end of 1954-55 season when the first eradicator spray was applied.

For the five seasons of these experiments, excellent commercial control of black spot has been obtained at each location. The treatments, averaging less than one spray application per year, held the disease on the threshold of eradication.

Black Spot, District Control Demonstration at Yetholme.—The black spot control demonstration at Yetholme, was in its final year of the district wide project.

For the 1959 post-harvest treatment the fungicide was supplied to the growers. They were to apply the spray, using their own equipment. Despite the work done previously by officers of the Department of Agriculture, observed by growers, and the numerous meetings and field days to discuss details throughout the course of the work which began in 1956, and despite the fact that each grower had a copy of the recommended programme, the approach to the treatment within this small group of ten commercial growers varied greatly.

Where the recommended procedure was followed, success was achieved; but in some cases substantial losses occurred where the treatment was not followed. In two cases the spray was not applied until August, and then only when the growers concerned were specifically requested to do so. It may be very significant that the result was very good in each of these cases.

The experience was a clear demonstration that, because of the difficulty of enlisting uniformly complete co-operation within even so small a group of growers, practical extraction of the full value of the 0.1 per cent. P.M.C. treatment is likely to be limited to isolated individual orchards.

The success of this demonstration at Yetholme is well illustrated in the one rather isolated orchard (31 acres) where all of the requirements have been met throughout the period. This orchard was sprayed with 0.1 per cent. P.M.C. in autumn 1956, autumn, 1957, and autumn, 1960. Treatment through the respective growing season has been restricted to 3 or 4 wettable sulphur sprays for powdery mildew control; except that in the 1956-57 season a few widely spaced sprays of ziram were also applied. Throughout the period, yields from the original bearing area have approximately doubled; and virtually no fruit loss has occurred through black spot infection.

Some of this grower's new plantings are just now coming into bearing, practically free of black spot; and young trees, planted in 1956 and subsequently, dipped in P.M.C. before planting and never since sprayed with a fungicide, are free of black spot infection.

On this particular orchard, by the end of the 1957-58 season the disease was on the threshold of eradication. Six infected apples were detected in the 1956-57 crop. No further infection was noticed until the 1959-60 harvest when, following a very slight late-in-the-season re-appearance of black spot in parts of the orchard, a few lightly infected apples were detected.

Observations will continue in this orchard for several seasons. As no eradicator fungicide was supplied to this grower in 1959 he was supplied in 1960 and has applied the spray under satisfactory conditions.

New Black Spot Recommendations Released.—Success of the foregoing long-range field testing and other experimental and commercial field projects, supported by laboratory evidence on the efficiency of the P.M.C. post-harvest eradicator treatments, led to official recommendations for this form of treatment.

The new recommendations offer growers a choice between three concentrations of P.M.C., as follows:—

- (1) A post-harvest spray of 0.01 per cent. P.M.C., followed by a reduced spring schedule or by the "after-infection" method of control.
- (2) A post-harvest spray of 0.05 per cent. P.M.C., followed by a reduced spring schedule or by the "after-infection" method of control.
- (3) A post-harvest spray of 0.1 per cent. P.M.C., followed in the first season by the same as in (2) above and in subsequent seasons by no protective sprays.

The third method is the only one requiring isolation; and is likely to be suitable only in isolated individual orchards that may be brought into proper order for the treatment.

Three conditions are prescribed for best results with any of the above treatments. They are, a clean orchard "floor" at the time of treatment; extremely thorough spraying before excessive leaf-fall occurs; and non-disturbance of the leaf litter in the spring.

The recommendations prescribe also that young trees be dipped in 0.1 per cent. P.M.C. before planting.

These recommendations are the first of their kind ever to be issued in any country.

P.M.C. as a Black Spot Eradicant Ground Spray.—On 7th September, 1959, black spot infected apple leaves from the 1958-59 season (they had over-wintered at Orange and contained maturing perithecia of *Venturia inaequalis*) were dipped in the following mixtures: P.M.C. 0.01 per cent., P.M.C. 0.05 per cent., P.M.C. 0.1 per cent., Dinoc 0.5 per cent., water, each containing a wetting agent. When checked in mid-October, 1959, the rates of spore discharge per square inch of leaf litter surface were found to be 0; 0; 0; 121, and 1852, respectively. Thus, P.M.C. at a concentration as low as 0.01 per cent. may have a great potential as a late winter ground spray. Field evidence at Yetholme, from ground sprays applied in August, supported this hypothesis.

Black Spot Eradicant After-infection Sprays.—An experiment on Granny Smith apples at Orange, compared P.M.C. 0.005 per cent., phygon, melprex and aacuram as "after-injection" eradicator sprays in the spring. Trace infection occurred on the adjacent non-sprayed tree, but there was no infection on any treated plot. Apparently, each chemical had sufficient eradicator action to prevent the trace of infection.

Comparison of Fungicides' Effects.—At Orange, effects of the fungicides captain, aateck, lime sulphyd, glyodin, melprex and phygon were compared on Granny Smith trees.

Lime sulphur's restriction of yield was again apparent. Lime sulphur plots produced the greatest number of apples (8,400) but the yield in cases of fruit was the lowest. The size restriction was illustrated by the average of fruit per case; 140 for lime sulphur, while for the other five treatments the range was 95 to 102.

Both lime sulphur and phygon caused moderate russet and fruit from both these treatments had a rough "finish". The fruit from the other plots was excellent.

Bitter pit incidence was high with all treatments except lime sulphur.

Each fungicide gave excellent control of black spot. The highest infection was 1 per cent of fruit showing one or more lesions, in the lime sulphur plots. Unfortunately, the inoculum level was rather low and the non-sprayed tree adjacent to the replicated plots became infected only to the extent of 60 per cent of the fruit.

A two-case sample of fruit from each tree in this experiment has been stored for subsequent examination for the development of "late spot".

Apple Yield in Relation to Fungicide Treatment.—The five-year experiment at New England Experiment Farm, to compare the yield of trees under thiram and sulphur schedules, was completed. The result again favoured thiram. Final analyses have yet to be made, but it appears that over the five years the trees sprayed with thiram have outyielded the lime sulphur trees by some 20 per cent.

Saprophytic Development of *V. Inaequalis*.—Late in May, 1960, an experiment was commenced where in nineteen treatments were applied to batches of fifty heavily-infected Granny Smith leaves at Orange. The treatment involved two concentrations of P.M.C., with and without wetting agents; with the leaves arranged in various ways for overwintering. Included in these treatments are phygon, melprex and aacuram, being tested as post-harvest eradicators. Saprophytic development of the fungus will be followed microscopically through the winter. Relative efficiency of the various treatments will be determined by spore counts in the spring of 1960.

Powdery Mildew (*Podosphaera leucotricha*) of Apple.—A demonstrational trial was conducted at Orange. Rows of Rome Beauty apples respectively were treated with lime sulphur, karathane, or wettable sulphur, in the type of schedule recommended by this Department. Mildew developed on the shoots in all treatments; but to a much lower degree than in the non-sprayed trees or the trees treated by the grower with a reduced schedule of wettable sulphur. Effect of these treatments should be more evident in the amount of infection that develops on the growth in the spring of 1960.

Virus Diseases of Pome Fruit.—Investigations on virus diseases and virus-like conditions in apple and pear trees continued at the Gosford Citrus Experiment Station. They comprise virus transmission studies with apple measles, apple green crinkle, apple "wood tumour", pear "ringworm" and pear "fissure bark". No evidence of transmission has yet been noted.

Two Gravenstein trees, on Jonathan seedling stock, which survived heat therapy treatment for flat-limb virus inactivation in 1956, are growing satisfactorily at Bathurst Experiment Farm. They have not yet shown symptoms of flat limb. Buds from one of these trees have been successfully worked on to seedling stocks at New England Experiment Farm.

Flat limb symptoms were observed at Orange on a Lalla tree top-worked on to Twenty Ounce, growing on seedling stock. Scions from this tree have been grafted on to another Lalla, similarly composed, in the same block.

Severe flat limb symptoms were also observed at Bathurst Experiment Farm, in a seedling selection of the cross Granny Smith x Stayman. This had been topworked on to the variety Babbitt in 1958.

At Orange, two limbs of a Jonathan apple tree showing severe apple mosaic were double grafted in 1957, firstly with wood from a tree showing mild mosaic and secondly with wood from a tree showing trace mosaic only. At the end of this, the third season (1959-60), there had been no change in symptom expression in the three sections.

Again at Orange, a Williams pear tree showing severe "ringworm" was grafted in 1955 with Winter Cole, Josephine, Beurre Bosc, Packham's Triumph and Williams. The Williams and Winter Cole grafts have grown fairly well and the others very poorly. However, no symptom of ringworm has yet appeared on any of the grafts.

Apple Measles.—The cause remains obscure. In an experiment at Orange, the "wither-tip" type of die-back associated with measles had no relationship to the copper nutrition of the tree.

No consistent nutritional relationship, nor evidence of virus transmission has been obtained. However, in almost all investigated cases, considerable root damage has been associated. In some cases this has been due to weevil larvae; in some cases it appeared to be due to a pathogen or root asphyxiation under impeded drainage.

Effect of the Deciduous Fruit Tree Improvement Committee.—This Committee functioned effectively through the year; and the sources of propagation wood used by nurserymen were inspected. The sources were generally satisfactory. Some nurserymen were advised of the location of a more satisfactory source of supply for particular varieties.

A State-wide survey of orchards and nurseries was done.

Significantly, apple ring spot was found to be much more widely distributed than was thought.

Brown Rot (*Sclerotinia fructicola*) of Stone Fruits.—Newer fungicides were tested in three spray trials. No indication of relative efficiency of control was obtained, as the disease incidence was very low. A blossom-spray trial in the laboratory indicated some as the most promising. Further testing will be necessary. The most promising were phyto-toxicity tested; to determine at what stage, and under what conditions, they may injure trees.

A spray trial was applied in dormancy, to determine whether Phenyl Mercury Chloride can eradicate overwintering infections of *S. fructicola*. Again, because of the low disease incidence, no conclusion was reached.

Two commercial size demonstrations of recommended control measures continued in orchards at Leeton and Griffith. Results indicated that, as well as a protective fungicide schedule, control of oriental peach moth injury of fruit is important.

Brown Rot (*S. fructicola*) Spore Population Studies.—Investigations of daily spore population in orchard air continued. Results confirmed the observations made in 1958-59. Indications were that diurnal periodicity of spore flight is not entirely dependent upon diurnal fluctuations in wind velocity. Some inherent character of the organism seemed to be involved; spore production and dispersal appear to decline as the organism's food reserves are depleted.

There has been great variation of the spore content of orchard air, at any specific time, from place to place in the orchard; probably due to uneven distribution of inoculum sources.

Presence, throughout the growing season, of low concentrations of brown rot spores in orchard air was demonstrated for the first time.

Practical implications of the sport trap results remained the same as enumerated in 1958-59.

Longevity of Conidia for *S. fructicola*.—A means of testing longevity of conidia of *S. fructicola* under field conditions has been devised. Preliminary results indicated that longevity in mid-summer may be something less than two months.

Infection "Chain" of Brown Rot (*S. fructicola*).—The infection chain studies have indicated the importance of infections of injured fruit, in maintaining the life cycle of the fungus.

A preliminary survey was made of inoculum distribution within trees. Great variability was noted; but it appeared that high levels of inoculum may occur only at short distances from a source. At distances greater than 12 inches from a source, inoculum level was considerably lower, and more uniform. Further from a source, inoculum level does not drop rapidly.

Previously Undescribed Means of *S. fructicola* Overwintering.—An important advance in knowledge of this disease occurred when a previously undescribed means of overwintering by the fungus was demonstrated. The fungus readily overwinters in infected fruit peduncles. The peduncles were demonstrated to be a major source of inoculum during the growing season following their infection. Most peduncle infections are caused through the rotting of attached diseased fruit. However, it was also shown that, under certain conditions, infection of peduncles from which sound fruit had been removed could take place.

Economic Toll by Brown Rot.—An investigation of fruit losses due to brown rot over the last eleven seasons has revealed an average annual loss of approximately £65,000 to growers supplying fruit to Leeton Co-op. Cannery alone. The greatest losses were sustained in the 1955-56 season, when fruit to the value of £320,000 rotted.

Rust (*Tranzschelia pruni-spinosae*) of Prunes.—In the Young district, investigations on the control of prune rust continued. Eradicative treatment using P.M.C. at 0.01 per cent, 0.05 per cent and 0.1 per cent on dormant trees, in three isolated orchards at Murringo and in one at Redbridge, failed to hold the disease.

In an experiment at Wirrimah the recommended three spray schedule was applied, using zineb at two pounds and at one pound per 100 gallons, with the adjuvants white oil, triton B1956, or agrol LN. Each of the six treatments gave excellent control of rust.

There was no rust in the plots treated at the two pounds per 100 gallon rate and only trace infection occurred, very late in the season, at the one pound rate.

This confirmed a previous indication that excellent commercial control of rust may be obtained from a three spray schedule of zineb at one pound per 100 gallons, provided a suitable adjuvant is used.

Chemical analyses, for samples of leaves collected before and after spraying, showed that where white oil was the spray adjuvant the zineb residue was higher both in deposition and retention. Triton and agrol residues were lower. Triton was better than agrol in most analyses.

Shot Hole (*Clasterosporium carpophilum*) of Stone Fruit.—At Wiseman's Ferry, thirteen old apricot trees, treated in the previous season with 0.1 per cent P.M.C. with very good results, were divided into three groups and treated on 29th July, 1959, when the buds were in the "balloon" stage. The treatments comprised P.M.C. 0.1 per cent, P.M.C. 0.05 per cent and P.M.C. 0.01 per cent. No injury occurred. Very good commercial control resulted from each, without further spray. There was no difference between treatments. No freckle (*Fusicladium carpophilum*) lesion was observed.

At Young a block of young almond trees with a history of severe shot hole infection was treated on 10th July, 1959, with 0.1 per cent P.M.C. No other fungicide was applied through the season. The result was very satisfactory. Good commercial control was obtained. At the same place some homestead trees, plums, cherries, peaches and apricots, seriously affected with shot hole in past years, were very clean this year after the single P.M.C. dormant spray. The peach trees were also free of leaf curl (*Taphrina deformans*). These diseases occurred freely in the district.

At Forest Reefs near Orange, a row of isolated plum, apricot, peach and cherry trees was sprayed with P.M.C. 0.1 per cent in winter 1959. These trees had a history of severe shot hole infection. It was brought under satisfactory commercial control by the single P.M.C. spray. The peach trees were free of leaf curl (*Taphrina deformans*). This had been very severe on them in the previous season and very prevalent in the district this season. Also, the plum trees, with a history of severe rust infection, showed no rust this season.

Bacterial Spot (*Xanthomonas pruni*) of Peach.—This pathogen was detected on peaches for the first time in New South Wales, in an orchard at Bathurst. All varieties present were infected. Frome and Dripstone were the most severely damaged. A state-wide survey was instituted; and the disease was also detected in two orchards at Orange. From enquiries regarding the incidence at Bathurst it would seem that the disease had been there for some years.

The season was favourable for bacterial spot infection. It was more severe and widespread than usual on plums. It was also recorded for the first time on cherry.

Cherry Leaf Spot (*Coccomyces hiemalis*).—A State-wide survey in autumn 1960, revealed no evidence of the disease. The disease has not been seen since 1951, when a single outbreak occurred in a Sydney nursery after the eradication measures adopted in 1950. It is safe to assume that cherry leaf spot has been eradicated from New South Wales.

Peach and Prune Tree Replanting Problem.—In an experiment at Young, water, ethylene dibromide, and a mixture of ethylene dibromide and chloropicrin are being compared as preplanting treatments; where prune trees are replanted following prunes. The trend of last year has continued, in that E.D.B.-chloropicrin treatment has allowed the best growth; E.D.B. is inferior, and water very unsatisfactory.

Also at Young, where prunes have been planted following apples, nemagon—either as a pre- or post-planting treatment or both—continues to result in poorer growth than a pre-planting treatment with vapam.

These results suggest that the problem of prune tree replant failure at Young is not simply a nematode problem. The parasitic nematode *Pratylenchus* sp. was found in high population in these soils at Young. Trees on the Buck plum rootstock are growing as well, without soil treatment, as are the trees on Myrobalan stock in sites treated with vapam. The vapam treatment does not appear to have increased the growth of trees on Buck plum stock.

At Newcastle an experiment comparing water, vapam, ethylene dibromide, and a mixture of ethylene dibromide and chloropicrin, as preplant treatments, was set up in a small peach orchard where the problem of replant failure has occurred. The nematode *Xiphenema* sp. is suspected as contributing to this failure of replants. No assessment of results of this experiment has yet been made.

Root Knot (*Meloidogyne* sp.) of Peaches.—An experiment has been commenced in Glenorie orchard where young peach trees are severely affected by root knot and where *Pratylenchus* sp. is also present. It compares water, nemagon, and a cover cropping treatment—involving the use of *Crotalaria spectabilis* in summer and oats in winter. The *Crotalaria* did very poorly, failing to compete with weeds, and a very sparse stand was obtained. No differences in tree growth were apparent. Dormant trunk circumference measurements have yet to be taken.

Crown Gall (*Agrobacterium tumefaciens*) of Peaches.—Two experiments were commenced in August, 1959, in two Sydney nurseries, to compare two preplanting dips for seedling stocks at the time of rowing out from the seedbeds. The dips were water, and terramycin 200 p.p.m., each for thirty minutes. In one experiment, half the area was pre-treated with aldrin (8 lb. a.i. per acre); to restrict insect damage to the roots. In the other, the treatment were applied also to a few "green stocks"; to check for phytotoxicity.

There was no adverse effect on the greenstocks, but the treated "hard stocks" suffered a slight set-back and were a little slower in their initial growth. Results will not be available until these trees are lifted next winter.

Virus Diseases of Stone Fruit.—The mosaic conditions on Halford peaches, reported in 1958-59 from Bathurst and Yanco Experiment Farms, has been found to occur throughout the older variety trials block at Yanco Experiment Farm. It is affecting the varieties Levis, Tudor, Vincent, Halford, Fairless, Sullivan, Gaume, Stanford, Ellis and Windra.

The disease may be plum line pattern, and not peach mosaic as at first believed.

All of the infected material at Bathurst Experiment Farm has been destroyed, and no propagation wood will be removed from Yanco Experiment Farm until further notice.

In the Young district, the Mahaleb parent trees that supplied most of the Mahaleb stocks used at Young, have revealed virus symptoms of the ring spot type. Seed transmission of such a virus may explain why a substantial proportion of certain varieties, notably Eagles seedling, fail on this stock.

Effect of the Deciduous Fruit Tree Improvement Committee.—The Committee arranged for a Statewide survey of orchards and nurseries. Widespread occurrence of a disease believed to be tatter leaf was revealed. The Committee also inspected nurserymen's sources of supply of propagating wood. Much of this was satisfactory, but more suitable alternative sources were recommended in some cases.

Bacterial Canker (*Pseudomonas syringae*) of Cherries.—At Gosford Citrus Research Station trees of several cherry varieties have been prepared for planting at Orange this winter in a long range experiment.

The experiment will test the practical value of working trees high on a framework of a resistant stock; compared with the normal, low working. Two resistant stocks have been used, Deister and Malling F12/1, and the high-worked trees have developed satisfactorily on these in the nursery.

Diseases of Tropical Fruits

Leaf Spot (*Cercospora musae*) of Bananas.—Good control of *Cercospora* leaf spot followed the application of mineral oil by means of portable misting machines. Special advantages of this over the conventional spraying method, especially in steep and boulder strewn country, has been widely publicised through press, radio and meetings of growers.

As a result, it has been estimated that not less than 10,000 acres of bananas were misted in the last season. Growers have been advised to apply 1½-2 gallons of a suitable mineral oil, as a mist, at three weekly intervals, commencing in early January and continuing until the end of May.

A close watch is being kept for any evidence to support some overseas reports, that continued use of oil ultimately reduces the vigour of the plant and therefore the fruit yield and quality. The misting method has not been long in use in New South Wales, and the total amount of oil applied per season is lower than in those countries where damage has been reported.

Leaf Speckle (cause undet.) of Bananas.—Severe leaf loss occurred during May, and mineral oil mist sprays giving excellent control of *Cercospora* leaf spot gave little, if any, control of speckle. However, an experimental programme of semi-concentrate sprays of fungicide in water, applied by portable misting machine, is promising control of both *Cercospora* leaf spot and leaf speckle.

Cordana Leaf Spot (*Cordana musae*) of Banana.—This has seemed a minor disease of bananas but during 1959 and 1960 it has caused considerable losses. It has been extensive in the Tweed, Richmond and Nambucca districts. Neither mineral oil nor mineral oil plus an oil miscible fungicide has been effective.

Root Rot (cause undet.) of Bananas.—Continued extensive studies on association of the burrowing nematode *Radopholus similis* with the root rot disease of bananas have indicated that it is the primary parasite in the disease complex.

Distribution of this nematode at various sites has been measured. The observations so far confirm that the nematode does not occur in virgin land, and would perish in the continued absence of bananas. Soil samples have revealed so far that, at least, more than five months from time of removal of banana plants is necessary for eradication of the nematode.

The "choked bunch" condition of bananas, previously considered a reaction of the plant to cold conditions, has been very closely associated with root rot and is possibly a symptom.

Bunchy Top (virus) of Bananas.—Division of Horticulture compilations show that during 1959-60 a total of 1,829 banana plants affected with bunchy top were detected; 816 less than in 1958-59. This 30 per cent reduction indicates that the disease is under control; but not that eradication is near, particularly in the more northern area. There, distribution is still widespread.

In Clarence River area only two infected plantations are known by Division of Horticulture, and these are under destruction.

As from 1959, plants may not be moved from plantations that have shown any bunchy top in the last five years; to avoid spreading the disease in a latent form.

Fusarium Wilt of Passionfruit.—Over several years, serious outbreaks of wilt (*Fusarium oxysporum* f. *passiflorae*) have occurred in the highland section of the central coast.

Work is in progress at Gosford Citrus Experiment station in co-operation with Division of Horticulture, (i) to select suitable disease resistant rootstock, and (ii) to develop an acceptable resistant hybrid.

The following varieties have shown resistance to the disease; *Passiflora edulis* var. *flavicarpa*; *P. incarnata*; *P. coerulea*; and *P. herbertiana*. The Golden passionfruit (*P. edulis* var. *flavicarpa*) has been superior to the others in that it is easily worked with *P. edulis*, does not sucker, produces a vine of good vigour and so far has reasonable cropping habits.

An acceptable resistant hybrid is being sought from a cross of *P. edulis* and *P. edulis* var. *flavicarpa*. Resistance was determined by dipping the roots of seedlings in an aqueous suspension of spores. Surviving hybrids (F_1) are being field tested for yield, type and other agronomic features.

Diseases of Grapevines

Downy Mildew (*Plasmopara viticola*).—Early spring favoured the disease, and heavy and frequent rain provided a good test of the adhesive properties of fungicides. In a spray trial at Orchard Hills, zineb plus copper oxychloride, followed by 5-5-100 Bordeaux mixture, gave the most satisfactory control. A commercial mixture of zineb and copper oxychloride, a copper oxychloride-sulphate and ziram rated next, then a colloidal copper and a mixture of ziram and copper oxychloride. Addition of triton to ziram greatly reduced its efficiency, and this mixture gave the poorest control.

Dead Arm.—In trials at Griffith, sodium arsenite applied to dormant vines gave almost complete control of dead arm. Later applications of captan and phaltan did not materially improve control.

Measles.—In trials in two blocks of vines at Coomealla, sodium arsenite sprays applied to dormant vines gave no control.

Progress of this disease has been plotted during two seasons. The disease is very sporadic. Vines with severe disease symptoms in 1959 were not always affected to the same degree in 1960, and some were free of symptoms; whereas, some others with mild or no symptoms in 1959 showed severe symptoms in 1960.

Leafroll (virus).—Chip grafts were made, from vines of Hunter River Riesling, Chasselas, Traminer and Frontignion, to indicator canes of Mission. This is to determine their virus status.

Further surveys were made in the Corowa area to determine the extent of leafroll infection in aged vineyards. The varieties Grand Noir and Alicante Bouschet appear to be 100 per cent infected. Grenache, which elsewhere in the State shows no symptoms of leafroll, showed 5 per cent of vines infested; and Bonbaden also showed a low percentage. There has been a recent report of vector transmission of leafroll in California. Therefore it is suggested that vector transmission may have occurred at Corowa.

Analyses of leaf samples from leafroll-affected and healthy vines indicate that potash level is lower in vines showing symptoms of the virus.

Bunch Stem Dieback.—Incidence was again high at Orange. Soil and foliar applications of boron increased the boron content of berries and foliage without reducing the disease. Spray applications of captan and phaltan slightly hastened maturity, but did not affect die-back. Analyses reveal slightly lower calcium and phosphorus in affected fruit than in unaffected fruit.

A Decline of Doradillo Grapes.—Declining vigour of the Doradillo variety at Coomealla and Griffith is now under investigation, to determine the cause. This variety is very heavy cropping, and nutritional exhaustion may be responsible in part. The decline is most serious in heavier and wetter classes of soil, and the possibility of a *Phytophthora* root rot as a factor is being explored.

Blossom Shattering of Brenache Grapes.—In 1958 an attack by *Botrytis cinerea* on flower parts was suggested as the possible cause. This appears to have been disproved. Application of P.M.C., thiram and captan sprays prior to blossoming had no effect on the incidence of the disorder. Weather at blossoming was rather hot and dry, and not conducive to *Botrytis* attack. *Botrytis* was not isolated from affected flower parts during the past season, though it was rather abundant in the previous year.

Diseases of Ornamentals

Diseases of ornamental plants were generally severe this year, and a number of new disease records were made. The spring and summer were moist and favoured development and spread of fungous diseases.

Azalea flower blight, and *Curvularia* leaf spot of gladiolus, both new records for this State, caused heavy damage. Powdery mildew of roses was unusually severe. Rose wilt (virus) caused less damage than in the previous year. Higher summer temperatures may have masked the symptoms.

Azalea Flower Blight (*Ovulinia azaleae*).—This was recorded for the first time in New South Wales, from Wahroonga in November, 1959. It was later found at Pennant Hills and Mount Wilson. A brown slimy decay of the flowers is caused. These dry out, and the browned petals have a "tissue-paper" appearance. Flat, black sclerotia of the fungus are formed in these petals. The browned flowers stay on the bush for several weeks, giving it a browned appearance. This disease has probably been present for some time.

Gladiolus Leaf Spot (*Curvularia trifolii* f. sp. *gladioli*).—This was recorded for the first time in New South Wales. It was severe at Wyong. Picardy variety was especially susceptible. The grower reported that the disease had also been severe in the previous year.

BACTERIOLOGY SECTION

Dairy Products Bacteriology

Butter Quality Survey.—A further survey of the butter manufactured in New South Wales was conducted to determine the biological quality.

The twenty-seven major factories were sampled once every week, and 682 butters were analysed. Of these, only 42 per cent met all the following standards: less than 100,000 total count; less than 20 yeast and mould; less than 10 coliform bacteria; and less than 1,000 casein-digesting bacteria. Yeast and mould counts in 42 per cent of cases, and coliform bacteria in 22 per cent of cases, were unsatisfactory.

This survey revealed a marked drop in quality by comparison with the 1958-59 survey, wherein 60 per cent of the butter met the above standards.

Cheese Starters.—Supplies of freeze-dried, lactic cheese starters were maintained for distribution to cheese factories. Some 1,120 cultures were supplied, and thus the steady increase in demand for this service was sustained.

A further six single strain starters were added to the collection. These were incorporated into existing starter rotations, in an attempt to help reduce the increased number of reported failures in the widely used "C series" of starters.

Cheese Quality Survey.—A small survey of the biological quality of cheese produced on the south coast was conducted. In all, twenty-five samples were analysed. As a result of the generally unsatisfactory bacteriological status of the cheese tested, a more comprehensive cover of these factories is planned for 1960-61.

Extension Services.—Two lectures were given for the Agricultural Bureau, at O'Connell and at Wyong, on soil micro-organisms. An intensive week of training in biology was provided for dairy factory apprentices at Newcastle.

Training of factory technologists in methods for the biological examination of milk, butter, cheese and other dairy products was conducted in Biology Branch. This has resulted in more efficient use of the two factories' laboratories concerned. An extension of this service has been requested for 1960-61.

Bacteriological Surveys.—Three biological surveys were conducted at the request of the factory and farms concerned. As a result, the source of a bacteriophage infection was traced in one cheese factory; the source of second grade cream was determined for a group of farmers on the far south coast; and the cause of an albuminous-like flavour in cream produced at Wollongbar Experiment Farm was identified.

Nitrogen-Fixing Bacteria

Distribution of *Rhizobium* Cultures.—Distribution of agar *Rhizobium* cultures to Experiment Farms and district agronomists was continued. Some 1,280 cultures were prepared for the inoculation of clovers, medics, vetches and field peas, cowpeas, and lupins, and for the tropical legumes of the U.P.S.E.T. pasture trials conducted by Division of Plant Industry.

Rhizobium Strain Additions.—Only two additions were made to the *Rhizobium* strain collection. These were strains for *Trifolium burchellianum* and *Dolichos lablab*.

Minor Investigations from Advisory and Service Work.—The more important results of these minor investigations were as follows: Current medic peat-culture strains were satisfactory for the inoculation of hairy peruvian lucerne (a strain of *Medicago sativa* L.). Thiram dusting of pea seed did not interfere with nodulation by inoculum applied to the seed after dusting.

Stock Strains for Winter Growing Pasture Legumes.—Field testing was completed. For vetches and peas the present commercial strain SU331 was adjudged superior to any other stock strain. No significant difference could be detected between stock medic strains, but NA39 was consistently the best strain and was selected as a commercial strain for use in emergencies. On the four test clovers, sub, red white and crimson, one stock strain was inferior but the others differed only slightly. For the clover group, NA50 is suggested as an emergency strain. NA50 and NA39 proved satisfactory in subsequent growth rate trials, in broth under factory conditions.

Summer Legume-Rhizobium Relationships.—An outline of this project was given in the 1958-59 report. The work in 1959-60 has been extended to include more species; many of them are important agricultural plants. The following table summarises the results so far:—

Nodulation of Some Typical Legumes by Local Commercial Inoculum Strains

Species	SU318	SU319	QA372
<i>Aeschynomene falcata</i>	+	+	—
<i>Calopogonium mucunoides</i>	+	+	+
<i>Centrosema pubescens</i>	—	+	—
<i>Crotalaria lanceolata</i>	+	+	—
<i>Cyamopsis tetragonolobus</i>	+	+	—
<i>Desmodium tortuosum</i>	—	—	—
<i>Desmodium uncinatum</i>	+	—	—
<i>Dolichos biflorus</i>	+	+	—
<i>Glycine javanica</i>	+	+	+
<i>Indigofera spicata</i>	+	+	+
<i>Leucaena glauca</i>	—	—	—
<i>Lotononis bainesii</i>	—	—	—
<i>Phaseolus bracteatus</i>	+	+	+
<i>Phaseolus lathyroides</i>	+	+	—
<i>Pueraria phaseoloides</i>	+	+	—
<i>Sesbania</i> sp.	—	—	—
<i>Stylosanthes gracilis</i>	+	+	—
<i>Stylosanthes sundaica</i>	+	+	+
<i>Trifolium semipilosum</i>	—	—	—

+ = effectively nodulated, — = failed to nodulate.

This work has already been of value in advising farmers and agronomists on suitable inoculum for trial sowings of *Desmodium uncinatum*, *Glycine javanica*, and *Dolichos lablab*.

Freeze-dried Seed Inoculants.—Despite the unpromising preliminary trial mentioned in the 1958-59 report, work finalised in 1959-60 showed that the commercial freeze-dried cultures produced in New South Wales were satisfactory field inoculants.

Trial soils varied, from some free of native rhizobia to one with a high population of ineffective strains and one with a high population of effective strains. In the last situation, serological typing showed that approximately the same proportion of nodules was due to inoculum strains; whether the inoculum was peat, agar, or freeze-dried.

Supervision of Quality of Commercial Freeze-dried Cultures.—In conjunction with Sydney University, a code of standards was established for the quality control of freeze-dried cultures by the U.D.A.L.S. organisation. This code included the requirement that freshly manufactured cultures shall contain 10,000 million viable rhizobia per culture.

As a check on quality, thirteen cultures were obtained from retail sources. Six of these fell below the viable count standard; five of these were cowpea inoculants and the other was a vetch culture. The cowpea inoculants are always difficult to produce. All six were only slightly below the standard.

By circular, district agronomists were requested to make careful observations on farmer use of freeze-dried cultures. The reports are not yet to hand.

Testing Commercial Legume Inoculants.—A third survey of commercial peat cultures on sale in New South Wales has been initiated, on a much wider scale this year. Samples from all districts are under test, but results are not available for report.

The additive mentioned in the report of 1958-59 was further tested this year. As foreshadowed in the earlier report, the claims of successful nodulation from seed inoculated fourteen days before sowing could not be substantiated. Present recommendations are to use the additive when sowing seed under unfavourable conditions of soil moisture, to assist survival of the inoculated bacteria.

Bee Diseases

Beekeepers submitted only twelve samples of adult bees for diagnosis of Nosema disease. Three positive cases were found. The escorts of 112 imported queens were examined for Nosema disease, before release of the queens from quarantine.

Five samples of brood comb were examined. One case was diagnosed as American Foul Brood. The other four were suspected cases of European Foul Brood, but no positive diagnosis could be made.

Entomology Branch

The following problems were amongst those given attention by this Branch during the year:—

FIELD CROP PESTS

Australian Plague Locust (*Chortoicetes terminifera*) Control.—Autumn, 1959, locust activity was considerable and further outbreaks in the spring were expected.

In September and October the expected hatchings were reported; extending from Tamworth, through Coonabarabran, Coonamble, Dubbo, Forbes, Molong, Condobolin and Young districts, to Wagga, Narrandera, Hay and Hillston districts. In comparison with the early part of the outbreak (1958-59), emphasis switched from north to south; the far northern districts reporting practically no activity, the central districts —not subjected to swarms in the previous year—a widespread and severe outbreak.

Of the described very extensive area, there were three main activity centres; broadly, the eastern section of the Bogan-Macquarie "Outbreak Area", the Forbes-Condobolin districts, and the Wagga-Narrandera-Hay districts.

For use by Pastures Protection Boards and landholders and in most districts, insecticide was supplied to strategic points throughout the area. Excellent control was achieved under difficult conditions of protracted hatchings.

During the 1959 spring, 14,647 gallons of 7 per cent BHC, 7,456 gallons of 15 per cent BHC, and 183 gallons of 40 per cent aldrin were used for ground treatment of hopping bands. This was followed by an aerial spraying campaign in November-December in the Condobolin, Hay, Narrandera, Wagga and Gundagai districts. During this aerial campaign, 1,018 gallons of 7 per cent and 2,565 gallons of 15 per cent BHC were used on flying or settled adult swarms.

The second locust generation was negligible. Isolated pockets of activity were reported from Gundagai, Wagga, Hay and Deniliquin districts. They caused little concern in the respective area. They were progeny of swarm remnants and survivors from treatment of the first generation; except, perhaps, in the Deniliquin area. The latter may have been from multiplication and aggregation of a local scattered population.

Field observations and comparison of amounts of insecticide used, with that put out in the 1953-54 outbreak, indicated that the recent outbreak was considerably less in intensity. This was partly due to the prompt and efficient control measures taken in many districts, aided by aerial spraying of escaped swarms; and partly due to less than ideal climatic conditions during the outbreak. The almost complete cessation of the outbreak after December, 1959, seemed due to a combination of these factors.

Reports of locust activity were relatively negligible from January to March, 1959, but on 21st March a large flying swarm appeared at night in the town of Condobolin. Other large swarms were reported in the vicinity within a few days, and in the Forbes district. Scattered populations of drifting adults were also reported, moving south in these areas, and in the Molong district at about the same time. Worst affected was the Condobolin district, but prompt use of a Wilmist by



Wheat Damage by Spur-throated Locusts

Spur-throated locusts (*Austracris guttulosa* and *A. proxima*) severely damaged wheat crops in a wide area of the north-west in September-October, 1959. They ate portion of the stalk of flowering stems just above the third node; causing the flower head to bleach and wither. The insects were proclaimed under the Noxious Insect Act.

Pastures Protection officers apparently successfully treated the larger, dense concentrations. Origin of these locusts is not known. No locust breeding had been reported from the above area or any surrounding district. Evidence points to the gathering together and movement of non-swarmling populations from their breeding areas.

An outbreak in the spring of 1960 is not expected. From reports and field observations, only localised areas are capable of producing actual swarms, although some areas possess a fairly high, scattered population. Forecast of likely events in far western and northwestern districts is not possible. Information from these areas is lacking.

Several Micron Sprayers were used by the Dubbo Pastures Protection Board, against large hatchings in October, 1959, using a drift spraying technique. Some very heavy hatchings occurred in the area treated and, shortly after, inspection revealed very low numbers over the whole area. There is little doubt that machines of this type can be used effectively against both hopping bands and flying swarms in some circumstances.

There was a further aerial spraying campaign against adult locust swarms in a number of districts during November-December, 1959. As in the past, aims were to prevent spread of heavy locust infestation into lightly or uninfested areas, to map and verify "driftways", and to intercept major swarms at key points on these driftways. The scope of this campaign was, however, much wider than in previous years, as an attempt was made to attack swarms over the entire extent of the infested region.

The spraying was done near Lake Cargelligo, Griffith, Ardlethan, Gundagai and Temora. The insecticide was applied by two Cessna 180 aircraft, using spinning brush equipment to break up the spray. A Cessna 172 was used extensively as a scout aircraft, and the total cost of the campaign was estimated to be £8,300.

Cessnas, used for the first time, proved to be most suitable. They had several advantages over Tiger Moth aircraft used formerly.

Swarm movements were related to terrain; and prevailing winds and tentative driftways were indicated in map form. Key points for swarm interception have also been established on these driftways. Experience during the campaign also added largely to knowledge of swarm movements and locust flight behaviour, and many of the infested areas can now be related to one another with respect to swarm movements, although a great deal of information has still to be acquired.

Dr. Uvarov, former head of the Anti-Locust Centre in London, visited Australia at the invitation of the C.S.I.R.O. Discussions were had with him and a visit was made to Trangie and Dubbo in November, 1959, to inspect C.S.I.R.O. ecological work on locusts. He was involved in a number of stimulating discussions with officers from C.S.I.R.O., Departments of Agriculture of New South Wales and Victoria, and the Waite Institute, concerning aspects of locust control and, particularly, the proposed Trial Campaign.

Dr. Uvarov's subsequent report for the C.S.I.R.O. recommended establishment of an interstate locust organisation, to carry out outbreak suppression measures and to co-ordinate and take over locust control responsibilities from the various States concerned. The proposals, if accepted, would have a far-reaching effect on locust control in Australia.

Wingless Grasshopper (*Phaulacridium vittatum*).—1959-60 was a most favourable year for development of this grasshopper. Practically every district on the southern tablelands and slopes reported widespread and severe damage to crops, orchards and pastures, including Bathurst, Goulburn, Yass, Gundagai, Wagga, Cooma, Bombala, Albury and Hume.

Recently hatched hoppers aggregated in late October and November, 1959, in subterranean clover and, as pastures dried off, the "swarms" migrated onto and severely damaged nearby crops, orchards and gardens. Heavy, but scattered, infestations were reported throughout the summer until March, 1960. Then the population started to decline.

Many landholders reported an effect on the carrying capacity of pastures, particularly in view of the dry summer in most areas. The term "grasshopper drought" was used extensively.

Spur-throated Locust (*Austracris guttulosa* and *A. proxima*).—These locusts damaged a wide area in September-October, 1959, including Wialda, Croppa Creek and Inverell districts. Though in comparatively small numbers, their damage was considerable. They ate only a small portion of the stalk of flowering stems just above the third node. This caused the flower head to bleach and wither.

In the Croppa Creek district, damage amounted to 25 per cent. crop reduction, over an area of about 80,000 acres. In one 400-acre crop the damage was estimated at 60 per cent.

The insect seemed to prefer certain wheat varieties. Saba, Eureka and Koda were worst affected. Gabo and Spica were intermediately and Festival the least affected. This could be related to the fibre content of the respective straw. Damage was severe in very rank patches in the crop, but some crops were near to 100 per cent. infested. Crops sown at lighter seeding rates, or thin crops, were not so much affected as thick and taller crops. Some feeding on ripening seed occurred later in the season.

Air and broom spraying with aldrin, dieldrin, and BHC were done. Early results were unsatisfactory, probably due to difficulty of contact with the insects in dense crops. Where improved types of nozzles were introduced, aircraft application was very satisfactory; either aldrin 5 oz. active ingredient per acre or dieldrin 3 oz. active ingredient per acre gave good control. These materials, as emulsions, had to be dispersed through the crops as micro-fine droplet sprays. Satisfaction depended largely upon successful crop penetration.

This insect was proclaimed, under the Noxious Insects Act, at the instigation of the Minister. Orders were then placed for considerable aldrin 40 per cent. concentrate for use in the Warialda, Moree, Narrabri, Inverell, Tamworth, Pilliga and Coonabarabran Pastures Protection Districts.

Black Soil Scarab (*Othnonius batesii*).—This scarab heavily damaged native pastures on soil areas in north-west districts. New areas of infestation recorded since the 1958-59 report were at Carroll, Quirindi, and Armidale-Uralla.

There is not yet sufficient evidence on whether the species is declining or increasing in numbers. However, there seems no decrease in amount of damage to native pastures, and very few of the grub patches have been re-grassed. Re-grassing of some patches appears to be explained by grazing management.

Life-history studies continued. In attempts to determine the length of different stages, there has been little success with the larval stages. Their mortality rate in the laboratory has approached 80-90 per cent.

Behaviour of adult beetles was further studied. An attempt was made to determine the factor or factors controlling daily flight pattern. The presence of two phases of females is now not doubted.

Factors controlling population changes were studied. Checks have now been kept on some patches for 18 months; and an idea of the part each factor plays in regulation of population density is being obtained. A theory has been advanced concerning the effects of soil moisture changes on population densities through overstocking and pasture management.

Six more control trials were put down. DDT appeared to reduce grub numbers but also has disastrously affected the Thynnid parasite.

The problem is still far from successful economic solution, but good progress has been made and interesting results are commencing to show.

There are some clear cut results from insecticidal treatments, using a new technique of experimentation. Useful screening trials are now possible. Results with some of organo-phosphorus insecticides are specially promising, though they are not usually considered as soil insecticides. On the other hand, results, with dieldrin and heptachlor, generally favoured as soil insecticides, appear unsatisfactory.

Numerous cereal and non-cereal plant species are under test for resistance or tolerance to grub attack. Rye corn has outstandingly withstood attack by large grub populations this season.

General assessment of grub damage, especially in pastures, was very largely obscured by the excellent growing conditions in the 1959 spring, but there was no appreciable reduction in grub populations. Crop damage was generally light; but in one small area of wheat, 50 per cent. of the area was wiped out by the grub.

Pasture Cockchafer (*Aphodius howitti*).—Observations in July, 1959, in Lidster experiment plots treated the previous season, showed that Lindane or BHC 4 oz. active ingredient per acre may give protection for two seasons, but re-infestation in the second season can occur.

Clover Root Weevil (*Annemus quadrituberculatus*).—In the winter and spring of 1959, root weevil infestations in north coast pastures were the heaviest since investigations began three years ago. They are most evident in ladino clover, the most widely grown species in improved pastures in the area. Extensive areas of well established, flourishing stands were wiped out or so denuded that they reverted virtually to pure grass swards. Infestations were worse in irrigated clover; this suggests that conditions for survival and multiplication were enhanced by this environment.

The widespread infestations and the intensity of damage underlined the need to control this pest if any species of clover is to flourish on the north coast, given efficient stock management and pasture nutrition.

Notable progress was made towards control of the weevil. In three separate experiments at Wollongbar and Kyogle, significant reductions in weevil larvae were obtained with dieldrin 1 lb. active ingredient per acre, dieldrin 1 and 2 lb. and dieldrin 1 lb. per acre. Promising but less effective control was given by aldrin 2 lb. and 3 lb. per acre. Four other insecticides gave negative results.

Control of root weevil is in sight. To determine optimum rates of dieldrin and heptachlor, an extended series of large-scale field experiments has been set up in Kyogle, Murwillumbah and Lismore districts. They are in irrigated and dryland ladino and subterranean clover pastures. The insecticides were applied with spray booms, or in fertiliser combinations. Dieldrin rates in this series range from $\frac{1}{2}$ lb. to 4 lb. per acre, and heptachlor rates from $\frac{1}{2}$ lb. to 1 lb.

White Fringed Weevil (*Pantomorus leucoloma*).—In an experiment at Cowra, further pre-sowing treatments were made in August, 1959; in land lightly infested—an average of one group per square foot. These treatments were: 1 lb. aldrin per acre, 2 lb. aldrin per acre, and 1 lb. dieldrin per acre. The treated area was subsequently sown to lucerne in mid-September. Earlier in the year, late February, 1959, soil applications of 1 lb. and 2 lb. aldrin and 1 lb. and 2 lb. dieldrin per acre had been made. Results should be apparent in July, 1960.

On this same property the growing of a crop of oats in infested lucerne country greatly reduced populations of the pest. Oats in rotation is a useful means of control, where this practice fits into a farm's economy.

In early February, 1960, an experiment was commenced on a property at Cowra, to find whether control could be obtained in a stand of infested lucerne. There was an average of ten individuals per square foot at the outset. Treatments were: (1) dieldrin 2 lb. per acre, applied by boom spray and cultivated in; (2) heptachlor 2 lb. per acre—granules mixed with superphosphate, applied by combine, and cultivated in; and (3) untreated.

When the treatments were applied on 4th February, 1960, about one third of adults had emerged, but the treatments were expected to be in time to kill new-seasons larvae on their way down into the soil.

Adult weevils emerged until late April; almost all by early April. The dieldrin treatment was very effective in killing adult weevils as they surfaced; the heptachlor-superphosphate treatment was less effective. Counts of grubs in the soil have not yet been made at the time of this report.

Trials have also been set down in infested lucerne stands in the Hunter Valley. Aldrin and dieldrin were applied in February, 1960, as a spray, and as a dust in combination with superphosphate.

Sorghum Midge (*Contarinia sorghicola*).—The increasing acreages of *Sorghum alnum* (Columbus Grass or Perennial Sorghum) has led to increasing numbers of *C. sorghicola*. Grain sorghum crops grown in the vicinity of *S. alnum* are badly infested by the midge.

S. alnum seed crops in the Graman area have been heavily infested. Yield reductions of from 60 to 80 per cent. have been common. During May, 1960, crops in the Inverell-Delunga-Gragin-Cherry Tree Hill-Oakwood-Graman area were surveyed, and very few were free of damage. The midge is becoming a more acute problem.

Green Vegetable Bug (*Nezara viridula smaragdula*).—Very heavy, prolonged infestations occurred in large areas in the north-west, with peak population in the period December to February. From mid-February, numbers declined. They were negligible by mid-April.

Lucerne stands were severely affected. Very little seed was set, and any seed that ripened was shrivelled. The plants dried off and lost a lot of leaf. Few plants escaped damage. Burrs, mintweed, Datura and wild gooseberry all supported the bug. Most of the summer legumes shown in row trials in September/October, 1959, failed to set seed.

Pruinose Scarab (*Sericesthis pruinosa*).—Very severe damage followed infestations by larvae of this beetle in improved and native pastures over wide areas of the Northern Tablelands during the autumn. Cocksfoot and ryegrass pastures were particularly affected.

Lucerne Seed Wasp (*Bruchophagus gibbus*).—Heavy infestation of lucerne seed crops was reported from many areas, causing low yields of seed.

A small-scale preliminary trial of systemic insecticides in infested lucerne at Spring Ridge, using rogor, dipterex and fluoracetamide, gave no indication that any of these materials as applied had control value.

Cotton Pests.—Anticipating the extension of cotton as a commercial crop, surveys of known and potential pests of this crop were made in the Narrabri, Leeton and Barham districts where a number of crops have been grown. In all districts surveyed, the most generally present and serious pest is the Rough Bollworm (*Earias huegeli*), whilst the Common Bollworm (*Heliothis obsoleta*) may be serious in some seasons. The Coon bug (*Oxycarenus luctuosus*) was present in most crops inspected but its role as a pest of cotton could not be determined. In small scale trials, endrin gave promising control of Routh Bollworm.

FRUIT PESTS

Banana Beetle Borer (*Cosmopolites sordidus*).—Experiments concluded in 1959 showed effective control over a period of thirty months, with a single dieldrin butt and ground spray. Dieldrin applications at intervals of two to three years instead of annually have now been advised for beetle-free plantations. Further work suggests that heptachlor may be a useful alternative to dieldrin against this pest.

Red Spider (*Tetranychus* spp.).—At Bathurst Experiment Farm, a codling moth experiment also gave a chance to compare "dimite" (DMC) with kelthane against *Tetranychus telarius* on apples. Both materials were at 0.03 per cent. strength. Kelthane gave excellent control, with some slight re-infestation on Jonathan apples 7-8 weeks after spraying. "Dimite" gave little control until after a second application. This almost eliminated infestation.

An investigation at Orange, where heavy infestation had built up on apple trees following applications of gusathion by semi-concentrate sprayer, indicated that the poor control was due to failure to secure adequate penetration of the trees, and not due to phosphate resistance.

An investigation at Spring Terrace indicated some degree of phosphate-resistance as the cause of indifferent results with trithion. In another case at Orange where there was very poor control despite the use of trithion, results were indeterminate. They pointed first to some degree of phosphate-resistance, but later indicated full susceptibility of the pest to trithion.

Relative values of several insecticides against *Tetranychus telarius* under Murrumbidgee Irrigation Areas conditions were established. Tedion and kelthane gave excellent results with one application. In two applications, Bayer 4935, ethyl gusathion, and DMC also gave excellent results. Trithion in one application was very good. Ethion in two applications was of little value.

In co-operation with the Division of Horticulture it was re-established that red spider mites, even in low populations, are responsible for "pear leaf scorch".

Advent of portable misting units for leaf spot control presented a chance to assess this type of equipment against *T. lambl* on bananas. Control of this pest had not previously been tried on a wide scale, due to difficulties of high-volume spraying in most plantations. In an experiment at Tullera, kelthane-water mixtures applied through a hand-directed misting machine at rates of 8 and 16 gallons per acre controlled red spider. A kelthane-oil mixture at 2 gallons per acre gave unsatisfactory control.

Cherry Aphid (*Myzus cerasi*).—At Canobolas the effect of late-dormant sprays was investigated. Applications of lindane 0.033 per cent in superior oil, at mid-budswell in mid-September, gave promising control of spring and early summer infestation. Incidence was delayed and the severity of infestation was greatly reduced. Lindane appeared slightly superior to DDT. However, most sprayed trees did become infested in early December. It was then necessary to treat them with an appropriate insecticide.

This experiment showed that in seasons favourable to the pest, even thorough late-dormant spraying does not do away with the need to apply growing period sprays.

Trend in control measures is towards elimination of late-dormant spraying and the application of one of the very efficient systemic materials early in the growing period. At Orange several systemic materials were tested during the growing period. Heavily infested trees were sprayed by airblast in mid-November. Malathion 0.06 per cent. was ineffective; mature aphids in inaccessible positions were not being killed. Metaisosystox 0.02 per cent. a.i., phosphamidon 0.02 per cent a.i., and PP175 at 0.012 per cent a.i., all gave excellent control, though some reinfestation occurred on phosphamidon trees after three weeks. PP175 and metaisosystox were outstanding, with PP175 perhaps slightly superior. Slight reinfestation was showing on metaisosystox trees some nine weeks after treatment, whereas none showed on PP175 trees.

Phosdrin 0.012 per cent gave a quick kill, but reinfestation occurred in two to three weeks; it was useful where spraying had to be done close to picking. Phosphamidon caused considerable leaf damage on Napoleon cherry trees.

Metaisosystox, phosphamidon, and PP175, applied three weeks before onset of infestation by cherry slug, gave protection from infestation by that pest; whereas malathion and phosdrin sprays permitted infestation. However, malathion 0.0625 per cent applied as soon as infestation appeared, gave excellent control.

Green Peach Aphid (*Myzus persicae*).—At Orange, in an experiment to evaluate DDT, endrin and lindane applied at late budswell, DDT 0.1 per cent, lindane 0.033 per cent, and endrin 0.02 per cent all in a superior oil formulation and applied at mid-budswell, all gave complete control. Endrin and lindane, at late budswell to pinking, were less effective but still gave satisfactory control.

When applied in the growing period, metaisosystox 0.02 per cent active ingredient, PP175 0.012 per cent, and phosphamidon 0.02 per cent all gave complete control. Phosdrin 0.01 per cent gave excellent initial kill, but there was some reinfestation two and a half weeks after spraying. Malathion 0.0625 per cent also gave good initial kill, but there was considerable reinfestation two and a half to three weeks after spraying.

The systemic sprays, phosdrin, metaisosystox "i", and lebaycid, showed out particularly well for control of established green peach aphid infestations in the spring at Leeton. The contact insecticides ethion, thiodan, malathion, and diazinon gave good, if, by comparison, inferior results. Gusathion and sevin were of no value in controlling this aphid.

Light Brown Apple Moth (*Tortrix postvittana*).—At Bathurst Experiment Farm, on Granny Smith and Jonathan apples, methyl-gusathion 0.05 per cent, ethyl-gusathion 0.05 per cent and sevin 0.1 per cent, all gave excellent control. Methyl-gusathion was best, but, commercially, there would be no difference between the effect of the three treatments. DDT 0.1 per cent emulsion, and DDT + lindane (0.084 per cent, 0.006 per cent lindane) wettable powder allowed substantial infestation.

At Kelso, near Bathurst, in an orchard where there was very heavy infestation by this pest in the previous season, five applications of gusathion 0.05 per cent at three-week intervals gave excellent control of the tortrix and of red spider. The latter also had been very troublesome the previous season.

In mid-April, 1960, there were slight signs of reinfestation by the tortrix some eleven weeks after the final application of gusathion.

Codling Moth (*Cydia pomonella*).—At Bathurst Experiment Farm, using Jonathan and Granny Smith apples, methyl-gusathion 0.05 per cent, ethyl-gusathion 0.05 per cent, and sevin 0.1 per cent, gave excellent control. The three treatments were equally effective. DDT emulsion 0.1 per cent and a DDT-lindane preparation (0.084 per cent DDT) gave indifferent control. There were six applications at three-week intervals on Jonathans, and seven applications on Granny Smiths. Visible residue on fruit was greatly reduced by the use of a 40 per cent gusathion wettable powder, as compared with a 25 per cent wettable powder. Residue was further greatly reduced by adding a special wetting agent.

Heavy red spider infestation occurred on the trees that received the DDT and the sevin programmes. Trees sprayed with gusathion remained free of infestation; except that on Jonathan trees infestation built up about seven weeks after discontinuing sprays of methyl-gusathion. Ethyl-gusathion was more effective; no infestation built up on trees sprayed with it.

At Young, in an orchard, almost 100 per cent codling moth infested in the previous season, a programme of eight sprays of gusathion 0.05 per cent, used at fortnightly intervals for the emergence period of the spring brood, and three weeks thereafter, gave complete control of codling moth, light brown apple moth and red spider.

Several experiments at Leeton showed that, with sprays at three-week intervals, satisfactory codling moth control could be obtained with: ethyl-gusathion 0.05 per cent, methyl-gusathion 0.05 per cent, and sevin 0.075 per cent. Each material also kept light brown apple moth in check. Ethyl-gusathion gave outstandingly good control of red spider mite, whilst methyl-gusathion kept it in check. Red spider populations built up after the use of sevin at 0.75 per cent.

Oriental Fruit Moth (*Cydia molesta*).—Conclusive results in respect of timing were not obtained in a trial on mature Golden Queen peaches in the Murrumbidgee Irrigation Areas. The value of DDT, gusathion, sevin, TDE and thrithion was demonstrated. Screening trials showed the value of sevin 0.075 per cent, and rogor 0.1 per cent; malathion 0.06 per cent and TDE 0.1 per cent were effective.

Good kills within infested fruit were obtained with phosphorin, lebaycid, rogor, DDT and dipterex.

At Glenorie, the Watts variety of early peach was sprayed three times at three-week intervals from 24th September, with the following insecticides: DDT 50 per cent W.P. (0.1 per cent); diazinon 20 per cent W.P. (0.05 per cent); dipterex 80 per cent sol. P. (0.08 per cent); gusathion 25 per cent W.P. (0.05 per cent); lebaycid 50 per cent emulsion (0.05 per cent); rogor 40 per cent emulsion (0.04 per cent), and sevin 50 per cent W.P. (0.1 per cent). Results were assessed by both tip and fruit counts, but no significant difference between treatments was observed due to a very low level of infestation. The two emulsion-formulated insecticides caused severe leaf burn and drop and almost complete fruit fall after the first spray. The others, all powder formulations, caused no noticeable damage.

In another trial, at Castlereagh, a large mixed block of late-maturing peach varieties was used. Six applications of the spray materials were made, at fortnightly intervals, commencing 6th November. The insecticides and rates of application were as in the preceding paragraph. Results from tip counts showed that gusathion gave good control of tip damage (1.5 per cent tip damage). Lebaycid (5.7 per cent tip damage) and sevin (5.8 per cent) also were promising. The remainder, dipterex (10 per cent tip damage), diazinon (12.1 per cent), DDT (13.8 per cent), and rogor (14.1 per cent) did not warrant consideration for further trials. Results from a smaller-scale fruit count followed the same pattern as the tip count results.

Citrus Gall Wasp (*Eurytoma fellis*).—This extended its range in the Sydney district, but is still not known to be present in any of the important commercial citrus-growing areas. Several insecticides tested previously, and some new ones, were selected for trial this year against this pest. Two applications of each insecticide (all at 0.1 per cent concentration), a fortnight apart, were made in February, 1960. Results were assessed by counting the galls per tree.

Only one of all the tested insecticides, namely fluoroacetamide, showed any degree of control of the wasp larvae. This systemic insecticide will be further tested, for optimum time and strength of application, etc.

Fruit Fly (*Dacus (Strumeta) tryoni*).—Conditions in most coastal areas suited average development of fruit fly populations. Losses were not unusually heavy. A severe heat wave in January, 1960, with a week of near-century temperatures and a maximum recording of 111°F., had no apparent immediate ill-effect on adult fly populations. Stinging was commonly seen during this period.

Fruit fly infestations were widespread and severe in many inland areas. Early and heavy infestation occurred at Tamworth in December, 1959, when a wide range of fruits, including figs and boxthorn berries were infested. Heavy infestations also occurred at Nyngan and Bourke at this time.

Fruit fly occurrences were recorded in backyard trees at Narrandera, Leeton and Griffith, from December onwards, but little infestation was recorded in commercial orchards. A vigorous campaign of spray baiting with malathion-protein hydrolysate was carried out in the town areas of Leeton and Griffith, with labour and materials provided by local co-operative organisations and commercial firms, under Departmental supervision.

An extensive outbreak occurred at Broken Hill, and Menindie was infested for the first time. A clean-up campaign was instituted by the Department in these towns.

The availability this season of the organo-phosphorus insecticide rogor, tested by this Department and subject of recommended spray schedules, was a boon to many home gardeners in particular. Maggot-free fruit and tomatoes were obtained in previously impossible situations. Good control of fly was obtained in many types of stone and pome fruits and tomatoes, whilst early citrus, although blemished by stings, was harvested as sound fruit. Moderate to severe foliage burn sometimes followed the use of rogor on some early stone fruit varieties, whilst early-ripening citrus fruits showed ring spotting.

Foliage burn by rogor on a considerable range of fruit tree varieties was compared at the most critical stage for burn, in November. Severe loss of foliage was again located in early peach varieties, Watts, Clarkes and Rennie, at strengths down to 0.02 per cent. a.i. Early apricot varieties Glangarry and Caselin showed susceptibility; but all other trees, including Newcastle and Trevatt apricots and all peaches later than Braddock, were not seriously affected at 0.08 per cent. rogor.

Lebaycid at 0.08 per cent. was less damaging to Braddock peach than rogor, while a rogor-formulation under the name "Dimethoate" was considerably more damaging to this peach. All three preparations were safely used in November, on early apples and on later apples.

Comparative-efficiency tests were conducted in a number of small trials, in which maggot development was and continues to be assessed. The results show that rogor, lebaycid and dimethoate are all useful on later peaches. EI.18708, said to be a rogor-type analogue, was included in a later apple-trial. It also proves to be an effective therapeutic.

A cheap simple trap was designed by Union Carbide Aust. Ltd. for use with Willison's attractant, containing canite impregnated with 1 gm. of para-hydroxy-benzylacetone and of malathion. These traps have been sited in trees at selected places in the Sydney region, in some western, north-western and south coast towns, and in the M.I.A. and some adjacent south-western towns. In the latter, the trap findings will aid the current eradication campaign for the M.I.A., both by locating the pest and providing evidence as to its presence in winter and spring and by its male-annihilation potential.

Except in areas other than those of known-outbreak in the southern region, these traps have shown fruit flies to be caught in all other towns—including Broken Hill and bush-land sites in the Sydney region—at least once during the past season.

As expected, on the experience of previous trapping work, the August-September period in the Sydney region gave considerable catches of male flies in mild sites. Thereafter, as the season progressed, relative catches in orchard and bush-land appeared to follow normal population change.

Thus the tin traps have been established in a useful manner.

Having become aware of some loss of flies dropped outside the male-traps, and the need for more complete recovery of flies in other experimental work in hand, attention has been given to the testing of principles involved; and an attempt is being made at more suitable designs for this purpose, in association with the C.S.I.R.O.

Ratio of attractant to insecticide, the use of different insecticides, and the addition of organic-phosphate vapour-pressure suppressors, e.g. "arochlor"—a chlorinated terphenyl resin, are also the subject of trials aimed at improving trap-catch of male flies.

Several chemical preparations related to para-hydroxy-benzyl acetone have been given an incidental qualitative test with laboratory flies. The chemicals have been received from Mr. A. Willison. They have shown that more powerful male-attractants may be possible. At present the propionate ester possesses some advantage, but is suspected of shorter useful life. This is being determined.

A laboratory cage trial was conducted to determine qualitatively, the relationship of (a) age for onset of reaction to male-attractant, para hydroxy benzylacetone, to (b) age at which female flies showed insemination. It has been shown in laboratory stock—that (a), precedes (b) by up to six days.

Workability of a male-annihilation hypothesis has been tested. There were two sites. At one site, baiting with male attractant and insecticide was adopted during the spring months to December. In the other case there was an 11 acre Valencia orange block where 64 grams of the male attractant was exposed with insecticide in traps during late spring in every 16th tree. Evidence as per stung fruit and, in the second case, per standard ammonium traps, supported the hypothesis until after December.

To establish "effective distance", as between attractant stations, for male-annihilation, experimental liberations of P32-fed (radio active) flies were made at Narara, Somersby and Kenthurst. This work was in collaboration with a C.S.I.R.O. unit. Promising, estimated recoveries of radioactive flies have been made. Further progress awaits establishment of an improved trap for this work.

Arrangements further to test male-annihilation in a discrete town area are in hand.

Commodity Treatment investigations were continued in collaboration with Gosford Citrus Wastage Research Laboratory and the Technical Committee on Sterilisation of Fruit Fly in citrus fruits. Fumigation of artificially infested fruits with ethylene dibromide was further tested; the pattern of EDB uptake in oranges was studied, and so too was fruit injury by EDB. Dipping the oranges for a few minutes in emulsions of EDB had obvious handling advantages, and will be investigated further.

In previous fumigation studies made at 70°F. there were no survivors out of 77,583 larvae in artificially infested oranges; when the EDB content in the juice of similar, clean fruits was not less than 1.5 p.p.m. at 30 minutes after fumigation.

Similar studies have now been made at 60°F. and 50°F. At 60°F. there have been no survivors among the 13,512 larvae so far tested, at an initial fumigation dosage rate of 24 oz. EDB/1,000 cu. ft.

At 50°F. there was one survivor in 25,938 larvae tested, with an initial dose of 24 oz. EDB/1,000 cu. ft. With an initial dosage rate of 32 oz. EDB/1,000 cu. ft., there were no survivors in 25,232 larvae tested.

Dipping infested oranges in the systemic organic phosphate insecticides rogor and lebaycid was tested. Larval mortalities were high, but not high enough.

Concerning bananas, experiments at Murwillumbah aimed to provide a commodity treatment to allow entry of treated fruit into fruit fly quarantine areas. Preliminary results suggest that when mature green fruit is dipped at harvest in rogor or lebaycid, larval development is inhibited.

Citrus Red Scale (*Aonidiella aurantii*).—The project in co-operation with I.C.I.A.N.Z. Merrindale Biological Research Station was continued.

In July, 1959, the February, 1959, treatments in the Yanco trial were assessed. Satisfactory scale control was yielded by the rogor emulsion, ethion W.P., trithion W.P. and gusathion W.P. applications; all used in combination with white oil emulsion; and by the standard applications—malathion W.P. plus white oil combination, and full strength white oil. The rogor treatments caused serious fruit marking. Endothion and I.C.I. experimental compound A.7031 showed no promise for scale control.

This experiment, on 192 Valencia trees, was continued in February, 1960, as a screening trial with methyl trithion W.P., dimethoate W.P., gusathion W.P., ethion W.P. and I.C.I. experimental compound PP.175 W.P. All were in combination with 1/100 white oil emulsion; with full strength white oil emulsion, and malathion W.P. plus white oil applications, used as standards. Single treatment programmes, only, were used; applied in late February.

Preliminary assessment of results had indicated that trithion W.P. with white oil, and dimethoate W.P. with white oil, were the most effective; and that PP.175 with white oil was of least promise.

White Wax Scale (*Ceroplastes destructor*).—The Kulnura experiment continued, in a re-organised form. It is on 144 Valencia trees, and comprises screening trials of sevin, trithion, rogor, phosdrin, ethion, lebaycid and dipterex. There are combinations with white oil. Compatibilities with Bordeaux mixture were checked, by applications of rogor, trithion, lebaycid, ethion and dipterex in combination with Bordeaux.

Unfortunately, the natural mortality of white wax scale, in the late January heat wave, destroyed any hope of results. Several successive days of near century temperatures, with a maximum recording of 111°F., occurred.

Lemon Bud Moth (*Prays nephelomima*).—Investigations into control of this pest of intermediate lemon blossom have been resumed. The economic value of control, in terms of increased crop of summer lemons, is being examined.

Nicotine sulphate and gusathion were used in autumn on 108 large lemon trees at Kulnura. There were three cover sprays of each material, at monthly intervals. Each programme gave very good protection against blossom infestation. Whether this has resulted in a greater fruit set of summer-crop lemons has yet to be seen.

VEGETABLE PESTS

Tomato Pests (*Heliothis* spp.).—A semi-concentrate water mixing technique for application of spray materials to tomatoes was developed at Murwillumbah, by joint activities of Entomology and Biology Branches. The technique came into wide usage on the north coast in the 1960 winter.

It embodies portable, lightweight, hand-directed misting machines, and low-gallage routine applications of insecticide and fungicide in water. Cost of pest control programmes is less, because less time and labour are needed. Moreover, the method facilitates spraying on the steep hillsides where many of the north coast crops are grown.

In collaboration with Biology Branch, mist application of insecticides and fungicides was tried on tomatoes at Gosford Citrus Experiment Station, Narara. A block of about 400 trellised tomatoes was treated weekly with a "Motoblo" misting machine. The insecticidal programme was DDT emulsion each week; with rogor included each fortnight, for added mite and aphid control.

Rates of application were adjusted so that the misted plots received the same quantity of active ingredients as similar, high-volume sprayed plots. This was achieved with about 1/15th the volume of water used in the high volume applications. The misting machine was operated at its minimum output, with maximum attention to application. The mist was directed at the plants, from both sides of each row.

Pest and disease control was good, and this misting trial was made subject of a well-attended Field Day.

Potato Aphid (*Macrosiphum euphorbiae*).—In a joint project at Murwillumbah with Biology Branch, the potato aphid was shown to transmit the non-mechanically transmissible tomato virus disease Yellow Top. This developed 18-21 days after feeding by infective aphids. Positive aphid transmissions to *Nicotiana tobacum*, *N. rustica* and *Physalis floridana* were obtained, but *Datura stramonium* failed to react.

Transmission to other indicator plants and possible weed hosts, together with determination of the length of the "inoculation-acquisition" feeding periods, and persistency of the virus in the vector, are under review. Aphid eradication in tomato crops has been attempted, by applying systemic insecticide weekly from seedling emergence to maturation of the first hand.

In the 12 commercial crops where aphid control was achieved, Yellow Top incidence ranged from nil to less than one per cent.

Bean Fly (*Agromyza phaseoli*).—A bean fly control experiment was carried out at Gosford Citrus Experiment Station, Narara, on a bed of about 1/20th acre of beans. It is further testing the insecticidal treatments of seed before planting. Dieldrin, aldrin, endrin, lindane and sevin were used, as simple seed dressings several days before planting.

The endrin, aldrin and dieldrin treatments greatly reduced bean fly damage consequent upon stinging in the first pair of leaves. This is generally the most important damage.

Garden Centipede (*Symphyla*).—Damage by garden centipedes to germinating beans in early spring has occurred in recent years on one property. It is suspected in two others. Treatments by using 1 lb. of 5 per cent. malathion dust or ½ lb. of 5 per cent. parathion dust per 100 feet of row, dusted into the planting furrow with the seed, were tried in July, 1959. They yielded no control information, as there was no significant occurrence of the pests. However, the treatments slowed down soil emergence of the young bean plants.

STORED PRODUCTS PESTS

Granary Weevil (*Calandra granaria*).—A grain storage trial laid down at Temora Experiment Farm on 21st December, 1955, was sampled in July. Both the pyrethrum-piperonyl butoxide ("pyrenone") and the magnesite treatments were still free of insects. The control (no treatment), and the carbon bisulphide treatment, were heavily infested.

Rice Weevil (*Calandra crysae*), and **Lesser Grain Borer** (*Rhizopertha dominica*).—In co-operation with Wm. Cooper and Nephews Pty. Ltd., their "Pybuthrin Grain Protection" (pyrethrin-piperonyl butoxide) has been under trial.

In December, a liquid grain-protectant was sprayed onto the grain mass as it was put into storage. It gave a theoretical concentration, on the grain, of 1.7 p.p.m. pyrethrins and 27 p.p.m. piperonyl butoxide. The spray was applied to wheat entering Grain Elevator Board silos at Hopefield, Duri, Inverell and Gunnedah, and also some 1,000-bushel silos on a farm near Tamworth.

Three-monthly samplings have been made. At six months after treatment, no primary insects have been found, nor has there been any appreciable rise in the temperature of the grain mass. At Duri, in the untreated control bin, a heavy infestation of *Rhizopertha dominica* has built up. No infestations by primary pests have been found in other untreated bins, but large numbers of secondary insects, especially *Oryzaephilus surinamensis* have caused some heating in the grain.

At Seven Hills Poultry Experiment Station, small-scale trials in three 500 bushel galvanised iron silos were laid down in February. Wheat already infested with *Calandra oryzae* was used. Both liquid and dust protectants were used. Each gave a similar concentration of insecticides, on the grain, as in the trials mentioned in the preceding paragraphs. Monthly samplings have been taken.

The spray treatment failed to control the existing infestation, and this parcel was then fumigated. No living insects have been found in samples from the dust treatment. In the control, untreated silo, an infestation of *R. dominica* has built up.

In all cases the protection given by the treatments has exceeded that which would be expected, as indicated by bioassay with *C. oryzae*. It is supposed that a mass repellent effect of the insecticide may be partly responsible. The spray treatment's failure to control an existing infestation supports that supposition.

In co-operation with Division of Animal Industry, there was a trial at Seven Hills to determine the effect of feeding "Pybuthrin" treated wheat mash to chickens. Using a short-term chick assay technique, feeding mash that was treated at up to ten times the recommended rates, there was no evidence of a trend in grain feed conversion and mortality of chicks. It would seem that "Pybuthrin" treated grain, fed at high levels for short intervals, produces no obvious effects.

Cockroaches (Periplaneta americana).—Laboratory trials to evaluate a silica-aerogel ("Dri-Die 67") against other standard dusts, for cockroach control, has been undertaken.

In tests to determine relative speed of knockdown and kill, 10 adult *Periplaneta americana* were exposed to small quantities of each dust. BHC gave the quickest knockdown, followed by diazinon, malathion and Dri-Die in that order. Dri-Die gave a complete kill in the shortest time, followed by diazinon, BHC and malathion.

In tests to determine the residual value of these dusts, bioassay after one month's exposure showed complete kill, with all dusts under test, in 48 hours.

This experiment will be continued. Stock cultures of the test insects *P. americana* have been maintained.

DOMESTIC PESTS

Argentine Ants (Iridomyrmex humilis).—The experimental eradication campaign successfully concluded on 1st December, 1959. Thereafter there was a survey of sites of garbage, other refuse, and spoil tips used by all of the councils in the County of Cumberland in the last 20 years. The survey revealed four infestations: at Five Dock, St. Peters, Kogarah and Fairfield.

Samples of ants submitted in the main towns of the municipalities and shires along the Hume and Olympic highways were examined in late February. Negative results were obtained. No Argentine ants were found in samples submitted in Newcastle and Maitland in late January, nor in a survey of the Newcastle wharf area, nor on the garbage tips of both cities.

Diagrammatic maps of all infested areas in Sydney have been completed, but little progress was made in mapping the areas on lot maps.

Twenty unsprayed areas of infestation in eleven municipalities, shires, etc., and covering about 600 acres, are now known, and a total of 202 areas, covering about 4,300 acres, has been sprayed since December, 1952.

A decision is awaited on recommendations for re-organisation of the Campaign for its continuation.

Coastal Brown Ants (Pheidole megacephala).—Liaison has been maintained with the Postmaster General, in trials of plastic cables insecticidally treated against ant damage. The problem continued to be serious in the metropolitan area. Trials laid down in February, 1960, using various insecticides, have given very variable results after three months.

Mosquitoes.—The Sydney Royal Botanic Gardens and the surrounding area were surveyed in March, 1960, to estimate the possibility of mosquitoes breeding in the Gardens and invading Parliament House. Some breeding of domestic species was found but the problem in Parliament House appears to have been caused by mosquitoes breeding in the parliamentary grounds and buildings.

The annual camp of the Mobile Malaria Field Laboratory (R.A.A.M.C.) was attended by an entomologist in January. The Williamstown-Shoal Bay areas were surveyed, and general control work was done.

Flies (Musca domestica).—Lebaycid, one of the newer organo-phosphates, appears to be slower acting than diazinon but has the advantage in stability on alkaline surfaces such as whitewashed walls in dairy buildings. A good kill of spiders also was a side-effect around the dairy buildings with lebaycid.

ANIMAL ECTOPARASITES

Poultry Red Mite (Dermanyssus gallinae).—An increase in mite numbers was accompanied by a fall in egg production on a poultry farm at Arcadia. Some of the poultry sheds were treated with sevin and this was followed by a quick return to normal production. At a strength of 0.5 per cent. it was applied, to saturation to the perches. A complete kill of adult mites was obtained. A few colonies of recently hatched larvae died out within a fortnight, indicating some residual efficiency.

At a concentration of 0.25 per cent. a good initial kill was obtained but several new colonies appeared about one month after treatment.

Australian Sheep Blowfly (Lucilia cuprina).—The original strain of resistant flies, established in November, 1957, has been cultured without selection, and has reverted to full susceptibility by its 25th generation. Dieldrin pressure for three generations at this stage developed resistance again.

The order of resistance to dieldrin and other cyclodiene derivatives, as well as gamma BHC, has been established with specially selected strains, homogeneous for dieldrin resistance.

Earlier indication that dieldrin resistance in the blowfly can be attributed to an oligogene has been confirmed. The work has been extended to include the reciprocal cross between susceptible and resistant flies, and has embraced a study with aldrin and gamma BHC as well as dieldrin.

The project yielded data for all possible crosses and back crosses, and has received favourable overseas comment. Since September, 1959, this programme has been supervised by Dr. J. M. Rendel of the C.S.I.R.O.

There is strong evidence that full dieldrin resistance can be held, provided the parents of each generation are treated with insecticide. In contrast, if a strain selected for full resistance is cultured in the absence of dieldrin it reverts towards susceptibility.

Contents of the preceding paragraph raise the query concerning an element of enzymatic adaptation or chemical transformation, in regard to insecticide resistance. In view of the possible importance of this finding the work will be repeated at the University of Pavia, Italy, for observation by Dr. R. Milani, a World Health Organisation consultant, in resistance genetics.

Because of the importance of insecticidal resistance the Department of Agriculture has seconded the entomologist concerned to the University of New South Wales for full time work on this problem. The study is being undertaken in the Department of Agriculture Insectary, Royal Botanic Gardens, under the guidance of Dr. J. M. Rendel.

An employee of Geigy Australia has continued, under the Chief Entomologist's supervision, a selection programme with organic phosphate insecticides. No indication of true resistance has been obtained from 16 generations of selection, to either diazinon or malathion.

Critical tests indicate that dieldrin resistant flies are slightly more susceptible to diazinon than dieldrin susceptible flies.

An additional survey, for resistance to dieldrin, in field populations, is under way. Resistance has been established in 9 of 10 strains tested.

Sheep Itch Mite (Psorergates ovis).—Screening trials with pairs of sheep have been continued at Glenfield.

Two field trials have been set up to make further tests on the efficiency of dymite and the glycerine based arsenic-derris. A small flock of 27 sheep has been used in a subsidiary trial at Glenfield, for further tests on dymite under (near) field conditions.

Results from spray-race treatment with high concentration malathion indicate that this method of application has no value.

In addition to those previously discarded, diazinon and sevin are considered to have no value for effective control. The number of promising formulations has not been increased.

Several sheep have completed a period of twelve months since treatment, without any reappearance of mite. These include sheep treated with lime-sulphur (single and double dip), liquid arsenic (double dip), powdered arsenic, malathion, dymite, glycerine based arsenic/derris, and arsenic/dieldrin.

A field test completed at Cowra indicated that malathion and dymite have some value for control in lightly infested flocks. Dymite has been subjected to a second trial at Orange and the glycerine based arsenic/derris has been applied to a flock crossbred sheep through a power spray dip at Albury.

SYSTEMATIC ENTOMOLOGY

Appointment of an Entomological Assistant has speeded up the assembly of accumulated specimen material. Some 64 new steel cabinets were acquired, bringing the total to 98. Thus, with the adequate working space in the new headquarters at Rydalmere, full provision for future planning of the entomological collection has been provided.

About 5,500 specimens were this year mounted and about 6,300 were incorporated in the collection. The difference was due to addition of specimens already mounted. Sixty-eight tubes of specimens were added to the spirit collection.

Major re-arrangements were carried out with the following groups: *Blattidae*, *Mantidae*, *Pyrrhocordiae*, *Coreidae*, *Rutelinae*, *Braconidae*, *Myrmecia*.

The Gracillariid moth *Caloptilia* (= *Gracillaria*) *azeela* Bronto has been identified as a leaf miner of azalea, probably for the first time in Australia.

A maggot, taken from under the skin of a goldfinch, was probably the Tachinid *Passeromyia longicornis*, known to attack fourteen species of birds.

The moth *Cryptotilia immersana* (Walk.) was bred from laurel leaves brought from Orange. It also attacks ivy leaves.

The Syrphid *Eumerus peltatus* de Meijere was bred from daffodil bulbs at Schofields.

A number of male hive bees with white eyes were received from Tuncurry.

The introduced Brachyderine *Sitona humeralis* Staph. has been recorded from Elderslie, Dalton and Jugiong; and a paper on the subject was published in the *Australian Journal of Science*, May, 1960, p. 453. It is of interest to note that the same species was intercepted in chicory from Italy in April.

TAXONOMY

Individual officers gave special attention to certain groups of insects, and some limited taxonomic studies were done on thrips, aphids and weevils. There will be more scope for this important aspect of entomology in the Division of Science Services' new headquarters now in occupation at Rydalmere.

Chemistry Branch

CEREAL SECTION

Death of Cereal Chemist James Russell Fisher.—The death of Cereal Chemist James Russell Fisher at the age of 50 years was a tragic shock to his friends and fellow workers. The Department suffered a severe loss. On graduation in 1933 from the School of Agriculture, University of Sydney, Mr. Fisher joined the Chemistry Branch. Since 1939 he had been in charge of the Cereal Section. His wealth of knowledge and experience were well known in the Public Service, in cereal farming communities and allied cereal industries. His reputation had grown within that period when cereal chemistry was becoming established in this country.

Rydalmere Laboratories.—Various officers of the cereal section have been engaged on plan details, electrical requirements, equipment installation needs, etc., arising from building of the New Science Services Laboratories at Rydalmere.

Funds have been made available to re-equip the cereal chemistry section there. In particular, the Farinograph and Test Baking Equipment, now obsolete, have been in use since 1935-36. They were the first installed in this country.

The new equipment also includes an automatic Buhler Flour mill. This, in combination with other instruments, should increase both the output and quality of the section's work, and will enable collaborative work with other cereal organisations to be placed on a more comprehensive basis. This type of mill is now installed in most Governmental laboratories throughout Australia, as well as in the more advanced laboratories in the milling and allied trades.

Some difficulties and delays have been experienced in the supply of some items of equipment. A number of them required indent from overseas. This has necessarily involved a considerable lag between order and supply. Most items should be to hand early in 1961 and thus available for use with samples from the 1960-61 harvest.

Staff.—During the latter half of the year, in addition to the death of Mr. J. R. Fisher, the cereal chemistry section lost a few junior members by resignations. Through the unavoidable time lag in replacement and the necessary training of new appointees, the year's programme of work has been seriously disrupted.

Collaboration with Milling Industry.—The section was visited by numerous members of the flour milling industry, generally seeking information on the quality of wheats for different purposes and their likely source of supply.

The industry's enquiries during the latter half of the year have reflected an apparently increasing demand for wheat types yielding soft flours of the biscuit type. This demand has unfortunately coincided with a shortage of this type of wheat. Seasonal conditions of the previous harvest had produced a crop combining high yield, high bushel weight and high protein content. This combination of harvest characters is seldom so marked. It was apparently due to the rainfall occurring just when the growing crop required it and so relieving the growing plant of any serious physiological stress at a critical period.

Training for Flour Mills' Laboratory Staff.—The section has, as in the past, made its facilities and experience available for the training of laboratory staff for four mills. Four such trainees from country mills spent periods in the section this year.

Data for the Standing Advisory Committee on Wheat (N.S.W.).—The late J. R. Fisher represented the Branch at the meeting of this committee in July, 1959. He presented data on the quality of a number of promising crossbred wheats close to the release stage.

The method of testing new wheats, for data to be presented at the meeting to be held in 1960, has been changed. It now follows a pattern in use in some overseas countries.

The present plan is that new, promising crossbreds approaching the release stage, and appropriate check varieties, will be tested in advance by a number of testing authorities and also by commercial firms (flour mill laboratories). Thus, the members of the committee, which includes millers, bakers, exporters and farmers, will have foreknowledge of the milling and baking characteristics of new material prior to the meeting. With this knowledge of quality, and the agronomic characters of a potential new variety, the standing committee would be better able to make a recommendation in respect of a potential variety and its effect on local and overseas trade.

The Department's cereal chemist is now responsible for distribution of samples to testing authorities under the code, and also for collation of information on quality for the committee on wheat.

Promising New Wheats.—Some of the material under review shows exceptional promise for both the north and south of the State.

In the north, the advent of new rust races has made the leading, strong varieties susceptible. The varietal picture could quickly change to give a general mixture of overstable and weak types. This, to say the least, would be most undesirable.

Three back-cross Gabo lines have had preliminary quality assessment in this Branch. They indicate that the desirable strong quality characteristics have been maintained; and this is of utmost importance to the balance of wheat types produced in this State.

Also, in the south, a crossbred produced at Temora Experiment Farm is showing good baking quality characteristics. This variety, if and when released, could also assist in the programme to increase gradually the overall baking quality of wheats grown in New South Wales.

Premium Wheats from 1959-60 Harvest.—Of the total grain receivals for the season 1959-60, a record quantity, approximately 7,000,000 bushels, commanded a premium. Of this figure 4,600,000 bushels was sold to local flour mills. The remainder was exported overseas, mainly to Austria and Japan.

Average of premiums for the sales to the home market was 20.2 pence per bushel; compared to an average of about 30 pence per bushel for the previous season's sales amounting to 6,192,000 bushels. The overall gain for wheat sold at a premium above f.a.q. is expected to be in the vicinity of 15 pence per bushel.

It is of interest that this is the first year that premium wheat has been available for export, and that the Gabo-type varieties are dominant in these sales. The strong, Gabo-type wheats also accounted for 75 per cent of the local sales. This represented 78 per cent of all monies received from local premiums.

Extension Service re Cereal Chemistry.—The section provided speakers at a number of centres. The main topics were the future of premium wheat sales, and the segregation of wheat. Addresses were given at field days in the north, at Mungindi, Rowena, Tulloona, Pallamallawa and Mount Russell, and in a Rural Science Course for farmers at Coonamble.

A paper on wheat segregation was presented by the cereal chemist to the Cereal Chemistry Conference in Adelaide, and also to a seminar within the Department.

Several radio talks were recorded, for distribution to country officers for their use in local farm radio sessions.

As in previous years, officers of the section acted as Judges and Stewards for the Wheat competition at the Sydney Royal Show. The method of judging, using chemical analysis as well as physical characteristics of the grains, gave farmers the chance of insight into the factors that affect a wheat variety's assessment for a specific use after it leaves the farmer's hands.

A point of interest and a cause of concern arising from the Sydney Royal Show was the entry of an adverse variety bred by a farmer breeder. Under the rules of entry the Agricultural Committee was forced to accept the entry, despite lack of knowledge of its parentage, disease resistance, and yield potential, as compared to recommended varieties. The sample had good visual characteristics but very poor baking quality. Its visual appearance, without testing, would tend to group the sample with the hard vitreous wheats that, as a group, have the better baking characteristics.

In the event of spread of such a wheat, a situation could arise as happened in the late 30's—when acreage of the variety "Boringa" increased largely. "Boringa" unfortunately had the same combination of physical hardness and poor baking quality, and was most unacceptable to the milling trade of the time.

PESTICIDES SECTION

Extension Services on Pesticides Chemistry.—Information relating to the properties and uses of available pesticides has been given on request to field officers, growers, and other interested persons.

Complaints from growers, involving pesticides or specific instances of injury to plants and animals following pesticide treatments, have been investigated.

Pesticide materials from various sources have been identified.

Kits for testing salicylanilide-treated bananas in the banana-growing areas have been maintained; by supply of special chemical reagents, and glass apparatus. This service ensures that adequate testing facilities are always available in these areas.

Regulatory Services.—Two analytical surveys of products containing the pesticides malathion and T.M.T.D. were done under the Pest Destroyers Act. This was an outcome of increasing complaints from growers, and their apparent justification. Both surveys revealed serious discrepancies in some products, between actual content and the content nominated by the manufacturer.

Another pesticide causing some concern is the anthelmintic, phenothiazine. Quality of this material in the past has been somewhat inconsistent, as regards biological efficiency. This seems to be linked with variations in physical and chemical properties, viz.: surface area, particle size distribution, and purity. Suitable methods for determining these factors, and relating them to biological efficiency, are being determined.

Evaluation of a BHC-containing preparation, reported by a firm to be effective against itch mite, is proceeding. Field trials at Glenfield Veterinary Research Station, and chemical analyses in the laboratory, have so far shown that this preparation does not substantiate the firm's guarantee as regards effectiveness. This is although it apparently contains the correct amount of active ingredient.

Constant checks have been kept on the quality of B.H.C. grasshopper preparations, to ensure their usefulness in the field.

Pesticide Standards.—Representation in the Pesticides Committee of the Australian Standards Association has continued. At the February meeting of the committee, attended by representatives of Government bodies and manufacturers, the future programme for preparing Australian Pesticide Standard Specifications was discussed. It was agreed that Australian-wide specifications could do much to help the marketing and use of pesticides in every State. Phenothiazine used as an anthelmintic in sheep was quoted as a typical example. The question of uniform labelling of pesticides was also discussed.

B.H.C., Grasshopper Control Specifications.—A specification for lindane was supplied to Government Stores Department, to facilitate purchase of nine tons of lindane for grasshopper control. This was necessary because of frequent difficulties in the past, in obtaining adequate supplies of formulated B.H.C. insecticide at short notice. The lindane (unformulated pure active ingredient) will be held in store against such emergencies, for release to formulators.

DDT Content of Dairy Products.—Investigations were confined to assessing the effects, on milk, from cattle dipped in two different types of currently marketed DDT formulation—supercooled melt, and a wettable powder.

Over a period involving ten fortnightly dippings, cattle dipped in the supercooled melt formulation showed a higher rate of DDT excretion in the milk than those dipped with the wettable powder formulation. This may be due to a greater absorption of DDT through the skin into the animal body, in the case of the supercooled melt formulation.

Absorption of the DDT probably takes place mainly from the DDT deposited on the hair of the animal. The supercooled melt formulation has been shown to deposit a significantly greater amount of DDT on the hair than other formulations.

Deposition and Retention of Fungicides on Foliage.—Some studies were made of the effects of various adjuvants on the deposition and retention properties of the fungicide zineb on prune foliage.

Field spraying of trees with a mixture of zineb/white oil has given prune rust control superior to that of straight zineb sprays. It was thought that the white oil acted as a "sticker" for the zineb, ensuring better deposition and retention of the fungicide on the leaf surface. Other adjuvants used, in addition to white oil, were triton B1956, and agral L.N.

Three sprays at two different strengths were applied at approximately six-week intervals, and leaf samples were taken immediately before and after each spray was applied. The zineb/white oil spray gave superior retention of zineb, but all treatments gave good control of prune rust. Further work on this problem is contemplated.

Pome Fruit Spray Residues.—During the 1959 harvest, samples of apples and pears were received from the Bathurst, Eatlow, Griffith, Leeton and Orange areas.

Forty-three samples were analysed. In most cases, two separate sub-samples were extracted, and at least two determinations were made on each extract. The analyses covered the following eight pesticides:—DDT, captan, ziram, T.M.T.D., malathion, gusathion, trithion, and parathion. With one exception (a sample containing DDT) the results were within the tolerances set by the F.D.A. (U.S.A.). In almost every case the result was very much less than the tolerance standard.

Considerable time was spent in developing new methods of analysis. These, in most cases, are found in the literature with insufficient detail.

Some experimental work has been done on the spray residues washing machine now installed at Bathurst Experiment Farm. The machine, specially constructed for this work, has been operated by the staff of C.S.I.R.O. Division of Food Preservation and Transport. The analyses are being carried out by the Department of Agriculture.

A number of washing trials have been made, and analyses of the samples before and after washing are being done. So far, the analytical figures indicate that the machine effectively removes a high proportion of a lead arsenate spray residue; but only a small proportion of DDT residue is removed by the treatments used.

Fruit tended to be bruised during the washing process, but this may be eliminated by modifications to the machine. Keeping qualities of the fruit will be studied by the C.S.I.R.O., particularly in relation to partial removal of the layer of wax.

The methods of analysis used by Commonwealth and State departmental authorities for spray residue determinations have been investigated. In general, analysis of spray residues on fruit has not had the same prominence in other Australian States as in N.S.W. Many determinations of lead, arsenic, and mercury have been made in other States, and there have been isolated determinations of other pesticides. Generally, the methods of the Association of Official Agricultural Chemists have been used.

Cattle Tick Control Research

Laboratory Experiments on Correlation of Tickicide Deposit and Dip Concentration.—Using bush ticks (*H. bispinosa*) sent from Bangalow, N.S.W., preliminary tests *in-vitro* to determine the relation between deposit and dip concentration were carried out. Rucide and Timbrol's formulation were used at concentrations ranging from normal to four times normal. The amount of DDT deposited is also related to crystal size. Therefore the dips were allowed to age, to permit crystal growth. *In-vitro* toxicity tests were carried out concurrently.

Glenfield Calf Trial No. VI.—There was field evidence that Timbrol's formulation did not control ticks as well as rucide when used in dips at similar concentrations. So, a trial involving twelve dippings and eight calves was conducted at Glenfield Veterinary Research Station from 7th January to 2nd March, 1960.

The object was to correlate dip concentration of Timbrol's formulation with the amount of DDT deposited on the hair of the calves, and to observe any toxic symptoms in the calves after treatment in the high DDT concentrations.

In the laboratory, the DDT deposited on the hair clipped from the dipped calves was determined; and the dip samples were analysed for DDT concentration. Changes in dip toxicity were determined by *in-vitro* tests, using bush ticks. The amounts of DDT deposited on ticks dipped in samples of the dip in the laboratory were also determined.

As dip concentration was increased, DDT deposit on hair and on ticks increased. There was greater increase on the ticks than on the hair, on a surface area basis.

Results indicate that a four times normal concentration of Timbrol's formulation would be required to give the same DDT hair deposit as from a normal concentration of rucide.

Photomicrographs have illustrated crystal growth taking place in the dip at Glenfield.

There was no apparent toxicity in the calves dipped in the higher concentrations. As the average age of the calves was five months, this result was not surprising.

Solubility of DDT and BHC in Surface Active Agents.—Solubility measurements for different surface active agents have been made. The data were used to elucidate earlier work and will be used later in "solubilised formulations".

Absorption of Surface Active Agents on Clays.—Measurements of absorption of surface active agents on clays continued. This absorption is important, since clays are frequently introduced into the dips by cattle and are used also in dispersible powder formulations.

Surface Active Agents' Effect on Toxicity of Formulations.—*In-vitro* tests, with bush ticks, to find the effect of different surface active agents on a DDT dispersible powder have been commenced. Triton 100 (nonionic), Iorol sulphate (anionic), and CTAB (cationic) agents have been used in range-finding trials.

Insect Cuticle's Effect on Toxicity of Formulations.—*In-vitro* tests with flour beetles (*T. confusum*), and bush ticks, showed differences in toxicity of a DDT formulation (rucide) and sodium arsenite. This is shown in the following table of LC50 values, and the results warrant further investigation.

	Ticks	Beetles
DDT (per cent.)	0.5	0.03
Arsenic (per cent.)	0.03	c. 0.5

WATERS CHEMISTRY SECTION

Water Analyses Service at Head Office.—The water analysis service of the Chemistry Branch has continued very useful functions in analysing water samples and advising landholders, by written report, on the suitability of water for stock, irrigation, and domestic use.

Nine hundred and seventy-five samples of water were tested at Sydney in the Chemistry Branch.

Field Analyses of Waters.—Apart from the analyses done in the head office laboratories, many samples have been analysed and reported on by country officers. The latter now have access to decentralised Water Testing Equipment Kits, these having been sited at each of the nine Agricultural Region headquarters. This was foreshadowed in the 1958-59 Annual Report. It was accomplished by the purchase, with Commonwealth Extension Grant funds, of certain electronic equipment and chemical apparatus. The kits are readily transportable testing units.

Field officers of the Department have had little or no difficulty in learning the operational techniques and interpretation of the analytical data. Their use of the equipment has facilitated "on the spot" information to landholders in respect of suitability of available waters for stock, irrigation and domestic use.

The new service, widely acclaimed by landholders, and the press, has been especially useful during the rather dry summer and autumn conditions.

In the first six months after siting testing kits in each Agricultural Region, some 500 samples were tested by the newly decentralised service.

The Water Test Kits are also being used to determine the salinity status of soils, where such problems can affect their productivity.

Tutorial Service for Field Officers, in Water Testing.—Progress and efficient functioning of the decentralised service would best be assured by a continuing supervision and instruction of Regional personnel by an officer of the Chemistry Branch. To this end, a minimum of two instructional visits has been made to each region. In some cases as many as four visits have been made. Further, regional officers have attended short courses of instruction at convenient centres.

Information Bulletin on Water Testing.—Considerable literature research has also been undertaken, to provide information and abstracts for inclusion in monthly Information Bulletins forwarded to field personnel and others with interest in the material. Early, the monthly bulletin comprised 150 copies but later it has been necessary to roneo up to 500 copies to meet the demand.

"Do it yourself meter"—"Salitest Meter".—As foreshadowed in the 1958-59 report, a transistorised, battery-operated salinity indicator meter has been produced. It was developed by Chemistry Branch in co-operation with a Sydney firm of electronic engineers. The meter is now available for purchase by landholders. It is being marketed by a Sydney firm.

Using this meter, a landholder may assess the salinity status of water, and the change that may develop in his usual supply, due to sea water intrusion in tidal rivers.

Meters of this type serve a very useful purpose, but do not have the accuracy or potential of the equipment in the Regional Water Test Kits.

Assistance to Electricity Commission.—Using equipment of the Regional Water Test Kits, assistance was given to the Electricity Commission of N.S.W. The electrical conductivity of waters available in town-water mains in N.S.W. was determined. These figures are of value to the Commission in safety measures associated with fighting electrical fires, and in washing high-tension insulators in the electrical distribution grid. Regional personnel were able to supply the data at short notice.

Assistance to Water Conservation and Irrigation Commission.—The W.C. & I.C. carried out a ground-water survey of the Nepean River Basin. The water samples were submitted to Chemistry Branch of the Department of Agriculture for analyses, and advice as to their suitability for stock, irrigation, and domestic use. Tabulations prepared from the analyses of seventy samples gave a clear picture of the variations in salinity in the area. Map isosals were prepared.

Hexham-Minmi Swamps Salinity Survey.—A salinity survey of these swamplands was undertaken by the Waters Section of Chemistry Branch, for Harbours and Rivers Branch of N.S.W. Department of Public Works.

Sea water intrusion from the Hunter River through Ironbark Creek has been having a deleterious effect on the sub-aquatic pastures used by dairy farmers for supplementary feed for stock.

A report has been furnished by the Chief Chemist. Successful reclamation of the swamp land, embracing some 10,000 acres, would provide a large number of economic farm units.

Fluorine Survey.—A survey of incidence of fluorine in surface and underground waters in N.S.W. was commenced during 1957-58. It has been completed. The survey has been based on analyses, over a period of many years, of 1,500 samples of water from rivers, creeks, dams, bores, wells, etc.

DAIRY INDUSTRY CHEMISTRY

Problems associated with the dairy industry received attention of the Chemistry Branch. These included:—

Analyses of Margarine.—Samples submitted by the Division of Dairying were analysed for composition and their conformity with the Dairy Industry Act of N.S.W.

Butter Samples pH Status.—The pH status of butter samples submitted by Division of Dairying was determined.

Standards Suggested by F.A.O. for Dairy Products.—Standards for butter, whole cream milk powder, part cream and skimmed milk powder, casein and cheese, suggested by F.A.O., were examined and compared with standards under the N.S.W. Pure Food Acts and Dairy Industry Act.

Some suggestions were made for modification of N.S.W. standards, where F.A.O. standards seemed desirable and in the best interests of the dairy industry.

Milking Machine Research; Tin-lined Pipes.—Five samples of tin-lined pipes as used for milking machine overhead milk lines were examined at the request of Division of Dairying to determine the degree of deterioration of the tin coating lining the inside of the pipes. Similar samples had been submitted in April, 1959, prior to the pipes going into service.

The later samples had been submitted to day-to-day usage, including cleaning by the Ruakura Alkali Acid Method. Considerable deterioration of the tin lining was found in four of the five samples of pipe submitted.

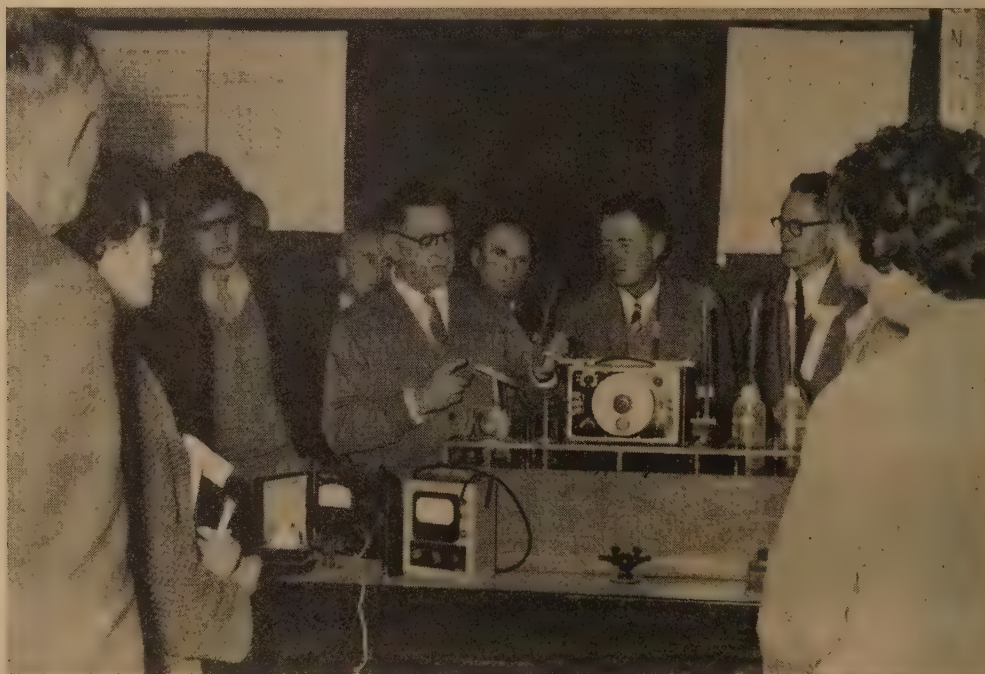
PHYSICAL AND ISOTOPES LABORATORIES

Facilities for Isotopic Tracer Work.—The decision that isotopic tracer work should be undertaken within the Department has been reviewed and reaffirmed. The special properties of radioactive isotopes enable information to be obtained which would not be possible by other means. A number of workers in the Department are interested in applying isotope methods in their work. Assessment of the need for establishment of the isotopes laboratory was based on typical examples of their foreshadowed investigations.

Having thus confirmed that special facilities for radioactive isotopes work were to be provided at the Rydalmere laboratories, it has been necessary to channel essential information to the tradesmen engaged on the new building and to clarify points in doubt.

Specifications, and designs where necessary, have been prepared for major isotopes equipment. Orders have now been placed for most of it. Delivery of most is expected to occur before the Chemistry Branch transfers to Rydalmere.

As the laboratories at Rydalmere have not reached a sufficiently advanced state of construction, the Department licence as a user of radioactive substances will initially only cover certain work, using I-131, to be done in conjunction with the Glenfield Veterinary Research Station. Later, a more comprehensive licence will be sought.



Water-testing Kits Demonstrated to Farm People at an Agricultural Bureau Congress

The Chemistry Branch in co-operation with a firm of electronic engineers has developed a portable "Do it yourself" meter—a "Salitest Meter". Using the meter a landholder may assess the salinity status of water; and changes that may occur through various circumstances. More comprehensive Test Kits have also been placed in each Agricultural Region for field officers' extension service.

Isotope Tracer Study of Goitre in Lambs.—Glenfield Veterinary Research Station has asked for co-operation in studying goitre in lambs, using I-131. Temporarily, it has been necessary to arrange for outside organisations to provide the facilities, but application has been made for a licence to cover this work, and Health Department has authorised the supply of I-131 pending issue of the licence. The work will commence early in the new financial year.

Radioactive Tracer Methods for Plant Nutrition Research.—The Plant Nutrition Section of Chemistry Branch desires to avail itself of the isotopic tracer facilities developing at Rydalmere. The practical aspects of such work are quite complex. Accordingly, the problems of the Plant Nutrition Section are being examined to determine where isotope techniques may be fruitfully employed.

Soil Phosphate Studies.—The Soils Section requires, on characteristics of N.S.W. soil types, information not obtainable from sources outside the Department. Initially the principal interest is in the matter of phosphate availability, where phosphate applied as fertilizer becomes fixed in many soils and is then unavailable to plants.

Action is being taken to develop experimental projects to provide the information. Much of this work, because of its physico-chemical nature, will also come within the sphere of the physical laboratory, as distinct from application of radioactive tracer techniques.

Lectures on the Use of Radioactive Isotopes.—A further group of six lectures was delivered by the Physical Chemist, to students of Agricultural Chemistry at the University of Sydney. The University desires that these lectures be repeated later in the present academic year.

Hilger Spectograph for Rydalmere.—A large Hilger Spectrograph is to be set up at the Rydalmere laboratories. It will permit determination of a wider range of trace elements than is possible on the medium instrument at present in operation in the Chemistry Branch. Meantime, arrangements have been made with the University of Sydney for an officer of this Branch to be suitably trained in large spectrograph techniques.

"Atomic Absorption" Techniques.—During the last six months, spectacular progress has been made in Australia in the development of "atomic absorption" techniques as applied to biological and agricultural problems. These techniques make it possible to increase greatly the output of "base exchange" data, compared with present tedious methods.

Arrangements have been made for the aforementioned officer (previous-but-one paragraph) also to have first-hand training in the "atomic absorption" methods.

SOILS SECTION

Fertility Studies at Bellingen.—Sampling of pastures from the six "Rates of Superphosphate" Trials in the Bellinger Valley continued. However, it was apparent in early 1960 that clover, which came away well earlier, would not persist. Thus, deficiency of nitrogen for grass growth could be expected.

Under these conditions the phosphate-response picture would be complicated by a dual deficiency. This has limited the value of the yield information, for purposes of correlation with the soil tests. In two of the trials, where clover made better growth, preliminary correlations were obtained, but the work will need to be taken further.

Results indicate that in a period of twenty-six months since superphosphate was applied, the "available" phosphate status of the soils has returned to its original pre-fertilizer level; even at the 6 cwt. of super. rate. It illustrates the high capacity of these north coast soils to "fix" fertilizer phosphorus.

Therefore, a correlation will be sought between yields in response to superphosphate and soil tests on a pure summer legume trial, in the first instance, where nitrogen will not be a limiting factor in plant growth.

Data from the large number of nitrate and ammonia analyses done on these trials have been re-examined. Because of poor legume growth no information could be obtained as to the effect of legumes on release of available nitrogen. However, the figures show a fall in available nitrogen during the summer growing period and a rise during the winter months.

Nitrate is present in small but rather constant quantities throughout the year but ammonia, which is the dominant form, rises during winter. Ammonia concentration is three times that of the nitrate during the winter but only one and a

half times the nitrate content in the summer months. Incubation tests on some of the same soils show an ammonia : nitrate ratio of 2 : 1. For comparison, the ratio of 0 : 2 for "black earths" from Glen Innes and Narrabri is recalled.

Soil Nitrogen Studies.—Investigations are continuing, to establish whether nitrate and/or ammonia produced on incubation of soils can be used as a measure of the nitrogen-supplying power of pasture and wheat soils in New South Wales. Good correlation with field response to nitrogen fertilizers is not expected. However, the work will at least yield necessary basic information on the soils. It will be a starting point for further work.

Soil Phosphate Studies.—Phosphate investigations are continuing, in an attempt to correlate crop responses with "available" phosphorus. A large number of soils, from various parts of the State where yield data is or will be available, have been tested for sodium bicarbonate-soluble phosphorus (0.5M NaHCO₃ at pH 8.5 using a 1 : 10 soil-to-solution ratio removes the water soluble P and a fraction of the absorbed P. It also removes P from some of the more soluble calcium phosphates in alkaline soils).

"Wheat, Uniform Fertilizer Trials"—Soil samples from "Wheat, Uniform Fertilizer Trial" sites, where yield of grain is measured against varying rates of superphosphate, have been tested for alkali-soluble phosphorus. Little or no correlation between wheat yields and the soil test was found. It is probable that the moisture regime, as it affects the yield of grain, is a potent limiting factor.

"Uniform Pastures Survey Extension Trials"—Soil samples from the "Rates of Superphosphate" trials in the U.P.S.E.T. range have also been analysed for "available" phosphorus.

Few yield data are yet to hand for assessing the value of correlation between yield or dry matter and the soil test values. However, the data from four trials situated on the north coast has indicated a reasonable correlation between the actual and measured quantities of "available" phosphorus in that area.

Soil Surveys.—Surveys commenced last year were completed, and brief broad-scale inspections of the soils in Inverell and Moree districts were made at the request of local agronomists.

Requests are in hand for three surveys, of part of the area to be served by the Tamworth research centre. Two of these will be commenced in the spring of 1960.

Soil Physics; Canal-sealing Project at Forbes.—Laboratory work involving permeameter experiments, in connection with an irrigation canal sealing project at Forbes, has been completed. This is a project in conjunction with the University of Sydney. Field experiments are under way.

Soil Physics; Groundwater Movement in Hawkesbury Area.—Work is under way in connection with the drainage and salting problem on the Hawkesbury River flats at Richmond. Several square miles have been affected by high watertables and high soil salinity.

A piezometer grid, on half mile squares, has been put down over a one and one-half mile square area; for a study of groundwater movement in the area. Results from this grid indicate that low potential fall towards the river is mainly responsible for the groundwater build-up. Permeability measurements are being carried out.

When this work is completed, the results should provide the basis of a practical drainage scheme.

Routine Analyses of Soils.—Large numbers of routine analyses were done for farmers and for departmental officers. One officer was employed full time on them. The usefulness of such analysis is limited, however, in the absence of field trial data. Phosphate tests are probably the best example of the limited usefulness.

Accordingly, plans are in hand for this Section to widen the field of investigations concerning the relationships between soil tests and field responses. This will be so for not only phosphate and nitrogen but also for cations and other elements.

This type of work will be extended to include potash, calcium, and magnesium determinations if graduates from the United Kingdom at present seeking positions with the Chemistry Branch are secured.

Soils Lectures.—One officer of the Section delivered seven lectures, on Pedology, Soil Classification and Soil Surveying, to second year students of the School of Agriculture, University of Sydney, and examined the students on these lectures. Four talks on soils subjects were given to Agricultural Bureaux schools and meetings.

PLANT NUTRITION SECTION

Increase in Plant Analyses.—Plant analyses work had increased dramatically over the last five years, and the last year has brought a further increase. Much of this analytical work has arisen from plant nutrition studies in co-operation with the Divisions of Plant Industry and Horticulture.

Some 13,253 analyses (a record) were done this year, compared to 11,000 in 1958-59, 9,000 in 1957-58, and less than 5,000 in 1956-57. This increased output still has not met the increased demand for plant analyses occasioned by pastures and field crops research and diagnostic activities.

In the total of 13,253 were 6,224 protein, 2,728 phosphorus, 817 potassium and 696 sulphur determinations. Each shows an increase on last year's figures, the sulphur analyses were more than double the total of sulphur analyses for the previous five years, but still only represent a fraction of the requests for sulphur analysis.

Glasshouse Investigations.—A number of projects in glass-house environment have been carried out in co-operation with the Division of Plant Industry, at Hawkesbury Agricultural College.

Grades of Sulphur in Relation to Plant Growth.—The availability and recovery of various grades of sulphur have been studied, in relation to plant growth. From previous work in the glass house, and one year in the field, there is strong evidence that the coarse fractions of sulphur are unavailable to the plant.

In some of the commercial fertilizers, it seems that any fraction coarser than would pass through a 100 mesh sieve is unavailable to plants. The firms have complied with advice, and are trying to overcome technical obstacles to meet the Department's recommendations.

Nitrogen Build-up.—Soils treated for a varying number of years with different rates of superphosphate have been sampled and sown down to grasses. A comparison is being made, in the response of these grasses to prior nitrogen build-up with clovers.

The soils are from the Pilliga Scrub area. When brought into production they would undoubtedly be used for growth of cereals. The nitrogen in these virgin soils is extremely low, but good wheat crops should be produced once the nitrogen has been built up with clover.

Phosphate Growth Responses.—There is great variation in the phosphate requirements of New South Wales soils, and the phosphate growth response curve has been studied on a number of the soils. Some soils respond almost linearly to very heavy dressing of superphosphate. Others, such as those from the Liverpool Plains, do not respond at all to phosphate.

Phosphorus, Nitrogen, Sulphur Investigations at Walcha.—A research project has been conducted for six years in the Walcha district. Valuable information has been accumulated on the phosphorus, nitrogen, and sulphur status of these soils.

Some of the results have recently been made available to an officer of the Commonwealth Bureau of Agricultural Economics for use in a paper on the "Economics of Fertilizer Use on the Northern Tablelands". Joint publications from the Plant Nutrition Section of this Chemistry Branch, and the Division of Plant Industry, are also being prepared, covering the chemical and agronomic aspects of the work.

Sampling—Techniques for Leaf Analyses.—Sampling techniques for leaf analysis are one of the most critical operations in leaf analysis. At Yanco, investigations into various sampling techniques have been initiated.

Citrus Nutrition Research, Gosford.—Pot experiments have been continued in co-operation with Division of Horticulture and Biology Branch. The uptake of plant nutrients is being studied in relation to tree growth and fruit quality.

Spring flush leaves are normally sampled from each of the trees and analysed for nitrogen, phosphorus, calcium, magnesium, potassium, copper and zinc.

Analytical data for the last two years are now available. They are with the Biometrician to work out main effects and first and second order interaction of these elements. The Biometrician is also studying the analytical data in relation to physical measurements of tree growth and fruit quality.

Citrus Nutrition Research, Hawkesbury Agricultural College.—In the diagnostic work of previous years, a difference has been observed in the uptake of minerals by trees grown on different rootstocks. At Hawkesbury Agricultural College there is an experiment wherein different stocks are being tested, in relation to their ability to take up chloride and manganese.

In this experiment near toxic levels of chloride and manganese have been applied to varieties on trifoliata and rough lemon stock. After a year's application of salts, the plants are not showing any symptoms; but there has nevertheless been a big difference in the uptake of both manganese and chloride by the different stocks.

The citrus on trifoliata stock are much more sensitive to the uptake of both chloride and manganese than citrus on rough lemon stock. Where high lime has been used, in the presence of high manganese, the uptake of manganese on both trifoliata stock and rough lemon has been considerably reduced.

In the coming year, an attempt will be made to induce salt toxicity symptoms and manganese toxicity symptoms on the trees. Analyses of these leaves will then be done, to correlate the symptoms with the levels of chloride and manganese in the leaves.

Citrus Yellows.—Leaf analysis investigations are being conducted into the problems of vitrus yellows, a condition observed over many years on young 4-5-year-old citrus in all parts of the world.

Salt Toxicity, Citrus.—Citrus seems to be the main plant affected by salt toxicity. Some are so affected that they are partly defoliated or killed by excess salt.

Salt analyses in routine diagnostic work in the past year have supported the findings of the Chemistry Branch project at Hawkesbury Agricultural College in relation to the different ratio of uptake of chlorides by different rootstocks; viz., that varieties on trifoliata stock take up much more chloride than varieties on other stocks. Leaf samples were taken from salt affected and unaffected trees grown side by side at both Monak and Curlwaa and the results are included in the table below:—

District	Fruit	Variety	Stock	Symptoms	Cl in leaf
					per cent.
Monak	Mandarin	Ellandale	Trifoliata	Partly defoliated trees	1.86
Monak	Mandarin	Ellandale	Sweet Orange	Healthy trees	0.27
Curlwaa	Orange	Valencia	Trifoliata	Affected	0.91
Curlwaa	Orange	Valencia	Sweet Orange	Unaffected	0.07
Curlwaa	Orange	Valencia	Sweet Orange	Unaffected	0.02

Salt Toxicity, Grapes.—The highest chloride content recorded in grapes during the year was 2.94 per cent. chloride.

Salt Toxicity, Beans.—Affected bean leaves from Curlwaa and Boel Creek showed 3.4 per cent. and 3.6 per cent. chloride, whilst healthy beans had a chloride content of 1.04 per cent. Considerable damage has also been caused by salt toxicity on the flats at Richmond. Some of the bean leaves from the Hawkesbury Agricultural College River Farm contained as much as 2.12 per cent. chloride.

Salt Toxicity, Lucerne.—Lucerne from Forbes, showing salt toxicity symptoms, had a content of 2.2 per cent. chloride.

The unaffected plants from the same paddock contained 0.78 per cent., and unaffected plants from a nearby paddock, 0.48 per cent.

Salt Toxicity, Roses.—Roses from the Wellington district contained 2 per cent. chloride and showed typical salt toxicity symptoms.

Salt Toxicity, Tobacco.—Over the three years the chloride levels in Bourke district have been followed with considerable interest. In 1958 the growers were having difficulty selling their tobacco because of the chloride content. In some instances it was as high as 7 per cent.

Tobacco quality is adversely affected by high concentrations of chloride. The tobacco plant has an unusual affinity for this element. It is capable of taking up vast quantities of chloride even where there is a relatively low concentration in the soil.

It is thought that the use of potassium sulphate may tend to depress the uptake of chloride, particularly if the irrigation practice prevents the chloride moving up from the region below the root zone.

Based on preliminary work, recommendations were made to growers to alter their irrigation practice and to use rather high rates of potassium sulphate and superphosphate. As a result the chloride content in the leaves has fallen considerably throughout the growing year.

Chloride content of the leaves was checked at monthly intervals on the crop harvested this current year. These leaves contained an average of only 1.6 per cent. chloride. Though it would be fairly high for most plants, it is a quite satisfactory level for tobacco.

Boron toxicity.—The most likely trace element to cause toxicity in citrus is boron. Literature records that 300 ppm of boron in the leaves of citrus plants can be considered toxic.

Boron toxicity is common in the Murray River irrigation areas. An example of boron toxicity occurred in 10-year-old rough Seville seedlings. They contained 430 p.p.m. boron. Long navels on Sweet Orange, from Monak, contained as high as 950 ppm of boron. One case of boron toxicity in grapes (925 ppm) at Coomealla was diagnosed.

Bunch Stem Die-Back in Grapes Investigations.—Analyses have been completed in an investigation into the cause of a condition known as "bunch stem die-back" in grapes. Portion of the fruit bunch fails to develop. The investigation is a co-operative effort of the Division of Horticulture, Biology and Chemistry Branches.

Fruit (minus seeds) and leaves, from an affected area at Orange and from an unaffected area at Liverpool, were analysed for all elements at the stage thought to be critical for the development of symptoms. In addition, boron analyses were carried out on leaves and fruit on affected vines from a trial at Orange.

Boron spray and soil application treatments were compared for boron uptakes. Spray treatment appears to produce only a short-lived increase in leaf boron level. Boron soil application caused a slight increase in the leaf boron content at the first sampling, but the level rose sharply in the later sampling, indicating a delay in uptake.

Manganese Toxicity.—Manganese toxicity has occurred at one time or another in many areas of N.S.W., particularly in poorly-drained acid soils. In diagnosing nutritional disorders, manganese toxicity has often been overlooked.

Recently, stunted field lupins from Wallacia, with pale and reddened leaves, were submitted to the Chemistry Branch for diagnostic purposes. As phosphate determinations were being carried out it was noted that during the digestion of the plant material in sulphuric acid a purple colour due to the presence of permanganate developed.

Manganese determinations were accordingly done. The affected plants contained levels well in excess of 2,800 ppm whilst apparently healthy plants contained 2,800 ppm. It is thought that even these "healthy" plants were bordering on toxicity.

Most plants suffer from manganese toxicity when the leaves contain more than 1,000 ppm. Exceptions are tobacco, field lupins, and lettuce, which may contain more than 2,000 ppm of manganese. Some legumes related to lupins, such as beans, are relatively sensitive to manganese, and, if healthy, normally contain 40-900 ppm.

Manganese Deficiency in Azaleas.—Iron deficiency as induced by excess calcium is usually the cause of chlorosis in azaleas. A case recently occurred at a Castle Hill nursery where the variety Albert Elizabeth, and six other azalea varieties, affected with chlorosis, were treated with iron chelate.

All varieties except Albert Elizabeth responded to the iron chelates. When leaves from affected Albert Elizabeth plants were analysed they were found to contain less than 8 ppm manganese. It is suggested that the chlorosis was due to a manganese deficiency and not to an iron deficiency.

Sodium and Potassium Imbalance in Apricots.—Severe leaf scorch in apricots from Griffith was found to be associated with high leaf sodium, and potassium levels which in leaves of normal sodium status would be considered marginal. Chloride levels were low but sodium was 1.51 per cent. in leaves from one farm, and 1.04 per cent. from another.

This condition appeared similar to that found in Granny Smith apples and pears from the M.I.A. some years ago (*Agric. Gazette of N.S.W.*, November, 1955, Cradock and Cook). On that occasion the potassium level fell to 0.52 per cent. K in affected apples, and 0.56 per cent. K in affected pears.

In the present case, the apricots contained 1.08 per cent. K. However, the critical level for potassium in apricots is higher than it is for apples and pears.

Fruit	Condition	Sodium	Potassium	Ratio K/Na	Potassium Deficient Symptoms expected when K falls below
		per cent.	per cent.	per cent.	per cent.
Apples (1955)	Affected	0.60	0.52	0.86	0.50 K
	Unaffected	0.12	1.76	14.65	...
Pears (1955)	Affected	0.72	0.56	0.78	0.50
	Unaffected	...	2.24	...	...
Apricots (1960)	Affected	1.51	1.08	0.72	1.0
	Unaffected	0.04	1.48	37.2	....

Potassium Deficiency in Match Timber.—Leaf samples from *Populus deltoides* var. *monilifera* were analysed, to determine the cause of a large area of stunted trees in the plantation of the Federal Match Company. Unaffected trees were twelve or more feet high. Stunted trees were 2 ft. 6 in. to 3 ft. high. Potassium was very low in the affected leaves (0.35 per cent. K) whilst healthy leaves contained (1.52 per cent. K).

Compound Phosphorus—Potassium Deficiency in Peaches.—Peach leaves showing symptoms attributable to combined phosphorus and potassium deficiency were analysed.

The condition, sometimes called "false little leaf", produces a narrow ragged type of leaf; caused by the dying of the leaf margin and its subsequent crumbling. In addition there is an interveinal chlorosis, with bronzing and necrotic spotting. To some extent, the symptoms of potassium deficiency are superimposed on those of phosphorus deficiency.

Leaves showing these symptoms, from Beelbanga (M.I.A.) contained the very low levels of 0.064 per cent. P and 0.19 per cent. K.

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Potassium Deficiency in Bananas.—Examination of banana leaves showing marginal scorch indicated, by analysis, that a combination of chloride toxicity and potassium deficiency is responsible. Affected leaves also contained 1.07 per cent. magnesium and unaffected 1.472 per cent. Affected leaves, however contained more than twice as much calcium as the healthy leaves. Where potassium is low, calcium and magnesium are much more readily absorbed.

Very little nutritional research has been done on bananas. Because of the value of the crop further work is proposed.

Cotton—Narrabri Experiment Station.—An interesting deficiency of magnesium and potassium was reported at Narrabri Experiment Farm. Cotton leaves showed interveinal chlorosis, suspected manganese deficiency and marginal scorch, and suspected potassium deficiency; on the same leaves. Analyses showed that the affected leaves contained 8 ppm manganese and 1.94 per cent. K whilst the healthy leaves contained 184 ppm manganese.

Nutritional Disorder of Cauliflowers.—Cauliflowers grown on a paddock, which had been sown to pasture consistently toppedressed with superphosphate, showed the effects of high nitrogen and phosphorus on the availability of potassium.

The young leaves contained 1.3 per cent. K and the older leaves contained 0.42 per cent. K. This is contrary to normal expectations, as potassium should be higher in the old leaves than in the younger leaves. On the other hand, nitrogen increased to a very high level in the older leaves; again contrary to the normal tendency. The presence of high nitrogen in the older leaves has apparently affected the uptake of potassium.

Calcium Deficiency in Yarloop Subterranean Clover.—Yarloop subterranean clover, from a three-year old stand showing leaf discolouration, was found to contain only 0.35 per cent. calcium; compared to 0.85 per cent. in healthy Yarloop from the same area, Nundle.

Loneragan (*Australian Journal of Biological Science*, 12: 1, February, 1959) has described three levels of calcium nutrition in subterranean clover. Severe calcium deficiency, associated with levels of 0.08-0.09 per cent. Ca, directly affects the clover plant. Moderate calcium deficiency, associated with leaf levels of 0.25-0.34 per cent. Ca, affects only the plants ability to fix nitrogen; but if the plants were supplied with nitrogen they would be able to grow satisfactorily. Only those plants with 0.57-0.86 per cent. of calcium in the tops were free of either nitrogen or calcium deficiency.

Condition of the clover from Nundle resembled the case of the moderately calcium deficient clover. Loneragan had also noted nodule degeneration under moderate calcium deficient conditions; a similar condition was observed in the field at Nundle.

YANCO RESEARCH LABORATORY

Rice, and Rice Soils Chemistry.—The main emphasis has been on relationships between nitrogen contents of soil, plant and grain. Many samples have been analysed also for phosphorus content; and potassium is to be determined on most of the leaf samples.

A small group of soil samples has been subjected to a more detailed analysis.

Some work on parboiling has been carried out, showing a reduction in mill breakage, but it is understood that the industry is not prepared to embark on this process at present.

Cooking tests were carried out on a number of samples with the idea of assessing cooking quality on small samples early in a breeding programme.

Effect of Nitrogen Fertilizers on Rice Soils.—A study was made of a waterlogged soil and the effect of adding three nitrogen fertilizers to it. Ammonium sulphate, urea, and

ureaform were added; at a level of about 35 ppm of nitrogen. Ammonium and nitrate nitrogen were determined on an acid/potassium sulphate extract. Nitrite and pH values of soils were also investigated.

It was found that nitrogen from the ammonium sulphate was present initially as ammonium in the soil. Later, a small proportion was found as ammonium and, later, as nitrate in the liquid above the soil. No nitrate or nitrite was found in the soil. The total of ammonium and nitrate nitrogen initially equalled added nitrogen, but after six months had decreased to approximately 17 per cent. of added nitrogen.

Urea gave similar results to ammonium sulphate but the values for ammonium nitrogen dropped more rapidly, without a corresponding increase in nitrate. The total decreased to 10 per cent. of added N.

Ureaform reacted in a similar manner, but the maximum of available N never exceeded 50 per cent. of added N. The final figure decreased to 8 per cent.

pH values of soils, originally 5.7, rose rapidly to 7.0; then gradually decreased to 6.6 and 6.7. Unfertilised soil showed a peak value for ammonium N between seven and fourteen days after waterlogging; about 8 per cent. of total soil N. Total soil nitrogen remained unchanged throughout the experiment.

These results for unfertilised soil are similar to those obtained in unirrigated fields; except for the absence of nitrate in the soil itself, and the relatively high proportion of ammonium N formed. The latter was equivalent to about 1 cwt. of ammonium sulphate per acre inch of soil. This suggested a possible relationship between grain yield and available nitrogen as ammonium.

Accordingly, some twenty-four district paddy soils are to be sampled, to determine ammonium N after waterlogging for ten days at approximately 80°C. It may also be possible in light of field trial results and in conjunction with the district agronomist, to suggest a suitable fertilizer treatment.

Nitrogen Content and Suncracking of Grain.—No relationship has been shown. This has confirmed the 1957-58 and 1958-59 findings.

Variation in Protein Levels in District Rice Crops.—District crops sampled at Whitton and Murrumbidgee storage sheds showed an extreme range of 5.6 to 7.9 per cent. grain protein; but the bulk of the samples were in the range 6.0 to 6.5 per cent.



Taking Quadrat Cuts in Sulphur and Phosphorus Trials on Walcha Pastures

Long-term trials dealing with the economics of using superphosphate and gypsum, respectively, have now completed a sixth year.

Soil Nitrogen and Grain Protein.—A small survey was conducted, with soils taken after harvest, and with corresponding grain samples taken at Whitton and Murrumbidgee storage sheds. These samples were selected as giving the highest and lowest grain protein figures.

Detailed analyses showed correlation $+0.775$ between soil nitrogen and grain protein. Determination of exchangeable bases showed a large variation (5 to 40 per cent.) in proportion of exchangeable sodium and potassium; and also in total exchangeable bases expressed as milli-equivalents per 100 gms. (-5.9 to 27.7). Organic carbon/soil nitrogen ratio was fairly constant; the extreme variations were from 12.1 to 17.8.

Major and Trace Element Needs of Rice.—Field trials with nitrogen, phosphorus and potash fertilizers have been associated with analyses not yet complete, of leaf and grain samples.

A definite response to nitrogen fertilizer is reflected in increased leaf nitrogen and phosphorus; the highest value usually being associated with the highest rate of N fertilizer.

Phosphorus and potassium fertilizers seem to have little effect on leaf N or P.

Nitrogen fertilizer tends to prolong the growing period, as shown by slower drop in leaf nitrogen. Phosphorus has the opposite effect.

Grain yields show small increases with fertilizer application. The main effect is a big decrease in yield with the highest nitrogen treatment. There is also a flat peak in yield at 2 cwt. level.

Potassium gives a slight but not significant increase in yield; and phosphorus a similar but opposite effect. For next year, a trial of low rate of two mixed fertilizers is suggested.

Oxygen Requirements of Rice.—Oxygen requirements of rice during germination and early seedling stages are being studied. Some interesting progress results have been noted. The experiments will be repeated.

Botany Branch

ROYAL BOTANIC GARDENS, NATIONAL HERBARIUM, AND ALLIED ACTIVITIES

Construction of Expressway

Construction work on the Expressway through the Royal Botanic Gardens and Domain has resulted in the destruction of many trees and shrubs, the closing of some areas to the public, and the unavoidable use of temporary roads, footpaths and entrance gates.

Drainage from the excavations has deposited considerable silt in the waterway through the Gardens and in the ponds, aggravating the normal silt-removal problem.

Construction of the Expressway has made necessary the demolition of the kiosk in the Domain. Plans for a new kiosk of modern design have been accepted. The building is in course of erection.

There has been an appreciable drop in the number of public visitors, except at week-ends, due to difficulties of access and the unsightly excavations.

The many problems have been subject of numerous conferences with officials from the constructing authority, the City Council.

Particular attention has been given to the siting of the new entrance gates, the redesigning of Shakespeare Place, the construction of a new service road to the depot from Mrs. Macquarie's Road, the treatment of the southern portal of the tunnel beneath the Palace Gardens, and the designing of the northern side of the Expressway between Shakespeare Place and Mrs. Macquarie's Road.

Royal Botanic Gardens

Improvements.—Several shrubberies have been re-arranged, enlarged or replanted. These include a new display of Azaleas, near the glasshouses, containing varieties not previously represented in our collections, and the replanting of two shrubberies, by Farm Cove.

A large bed adjacent to the kiosk, previously planted with *Hydrangea* selections, was changed into an exhibit of Australian plants.

Over a dozen new species were added to the medicinal bed and eighteen new rockery plants were introduced.

In addition, numbers of young shrub and tree species were set out in beds and lawns. Most of these represented species introduced over recent years through the exchange system. They have been specifically chosen to augment the exhibits of species of ornamental and botanical interest.

The propagating yard has been extended in an easterly direction towards the creek bank, and a new incinerator has been built in the depot area and is in operation.

Accumulation of silt in the upper and middle ponds and in the creek was removed by the Department of Public Works, and used elsewhere for filling and improvement work.

Strong north-east winds, coinciding with very high tides, flooded portions of the Lower Garden along Farm Cove. This necessitated the raising of the level in certain areas, and the construction of coping along the border of beds and lawns.

The sculptures donated by the trustees of the National Art Gallery were placed in selected positions. They have added to the attractions of the Gardens. The large bronze figures of "The Mare and Foal", and "Retaliation" are particularly effective in their chosen surroundings. The marble figures of Venus, Andromeda, Oenone, Hero, and others have also added charm and distinction to their areas.

Supply and Exchange of Plants and Flowers.—Three species of shrubs were received from Longwood Gardens, New Hampshire, U.S.A., and many species from various local sources.

The Gardens provided three dozen small shrubs for the Child Welfare Department's Home at Woollahra, cut wild-flowers for displays by Naturalists' Societies at Broken Hill and Adelaide, seedlings of cycads to Italy, and water plants to Adelaide and Brisbane.

Landscape Gardening Service.—The Landscape Gardener has planned and supervised the replanting of a number of beds in the Gardens and been active in matters arising from construction of the Cahill Expressway and restoration of the roof area of the underground parking station in the Outer Domain.

In addition, other departmental, semi-governmental and outside bodies, including six country, three outer-metropolitan and seventeen metropolitan institutions have been assisted.

In the metropolitan area, advice on landscaping and garden design was given to the Asquith Girls' High School, the Eastern Suburbs Hospital, the "Marsden" High School, Ermington, the National Fitness Camp at Narrabeen, the new Law Courts, City, the Division of Science Services at Rydalmere, and the Standards Laboratory, C.S.I.R.O., in the Sydney University grounds. Plans and reports were prepared for the following institutions: the Child Welfare Department's "Thornly Lodge", Baulkham Hills; the Bexley North Public School; the Benevolent Society's "Scarba Home", Bondi; the Chullora Bus Depot; the A.B.C. at Gore Hill; the Lidcombe State Hospital; the Narrabeen Methodist Old Peoples' Home; and the Royal Agricultural Society's Showground area. In the outer-metropolitan area, visits were made and advice given to the Child Welfare Home, Windsor, and the Water Board's Dam at Warragamba. Plans were prepared and planting supervised for the swimming-pool area at Hawkesbury Agricultural College.

Country areas visited for landscape advisory and planning purposes included Alstonville Tropical Research Station, Inverell parks and hospital grounds, Jenolan Caves, Kyogle Municipality and Kyogle Public School, Narrabri Research Station, and Singleton Hospital.

Lectures on landscape gardening were given on a number of occasions.

Glasshouse Activities.—Several indoor species have been added to the glasshouse collection and displayed in the public section. Interest in indoor plants is noticeably on the increase, possibly associated with the increase of flats and home-unit blocks.

Sections of the glasshouses open to the public have shown particularly fine displays of *Gloxinias* (*Sinningia* spp.), *Calceolaria*, *Cineraria* and *Primula*, as well as orchid species of *Cypripedium*, *Cattleya*, *Dendrobium*, *Coelogyne*, and many other genera.

Displays were prepared for and maintained at the Royal Agricultural Society's Easter Show, and the Industrial Exhibition, and at Parliament House for meetings of the Commonwealth Parliamentary Association.

The Domains

The Outer Domain has been used for the assembly of parades and of procession floats. Car parking was permitted in a limited area during Christmas week and during a transport strike.

Admiralty House

The grounds have been satisfactorily maintained, with some improvements. Field-Marshal Sir William Slim, on retiring from the office of Governor-General, forwarded a personal letter of appreciation of the work by the Gardens' staff in Admiralty House grounds.

Centennial Park

The Park was used for the usual sporting activities and for special features, such as cycle-racing and certain cross-country events held in connection with the Royal Easter Show.

Inspections and discussions occurred relative to use of certain areas for a community centre, and the use or sale of sand from areas in the south-western corner of the Park.

A new children's playground was established in Queen's Park.

National Herbarium

Plant Species New to New South Wales.—The following species were recorded for the first time in New South Wales from the localities listed. The country of origin, or the previously-known distribution within the Commonwealth is given in brackets:—

Cyperus reflexus, on banks of Parramatta River, at Parramatta (warmer parts of North and South America).

Diplachne parviflora, Moree (northern Australian and Darling Downs of Queensland).

Eleocharis dulcis, Tweed River flats (Queensland and Northern Territory).

Lindsaea dimorpha, Huskisson (Queensland).

Scleranthus miniusculus, south-west of Ivanhoe (Victoria and South Australia).

Stipa teretifolia, Point Perpendicular, on north head of Jervis Bay (Victoria and Tasmania).

Records of Rare Species.—The following rarely-collected species were identified:—

Astrotricha crassifolia, a shrub known only from two other localities in New South Wales and one in Victoria.

Epacris hamiltonii, Blackheath district. First described in 1900 from Blackheath, this species had not been collected again until July, 1959.

Eucalyptus michaeliana, Mogo Creek, near St. Albans; previously collected only from east of Armidale and one locality in southern Queensland.

Fimbristylis cinnamometorum, Moleville, near Grafton. This is a second record for the State.

Fuirena ciliaris, Moleville, near Grafton. A fourth record.

Pterostylis longicurva, Borah Creek, near Quirindi. The third record of this "Greenhood" orchid.

Trachymene cyanopetala, Acey's Gap, west of Forbes. Collected only twice previously, and not at all for the past forty years.

Xanthosia dissecta, Bulli Pass Lookout. Recorded only twice previously in New South Wales, though better known in the southern States.

Extensions of Range.—The following species have been recorded beyond their previously known range:—

Archontophoenix cunninghamiana, "Bangalow Palm", Pebbly Beach, near Bateman's Bay; a southward extension from Wandandian near Nowra.

Callitris oblonga, "Cypress Pine", head of the Hastings River; extending southwards from the Wollomombi-Ebor district.

Carex neurochlamys, near Ulong and the Dorrigo district; being southward extensions from the Richmond River.

Eleocharis pallens, near Armidale; an eastern extension into the Tablelands Division.

Eucalyptus ligustrina, a dwarf "Stringybark", Gibraltar Range, north-east of Glen Innes; a northward extension from a few restricted areas on plateaux north and south of the Shoalhaven River, and on the Blue Mountains.

Eucalyptus michaeliana, Mogo Creek near St. Albans; a southward extension of this rare species from east of Armidale.

Eucalyptus paniculata, "Grey Ironbark", Ingalba, near Macksville; an extension northwards from the Hastings River district.

Eucalyptus rudderi, "Coast Red Box", Wattagan Creek, between Wyong and Cessnock; a southward extension from the Gloucester-Taree district, except one old record from the Picton district.

Eucalyptus siderophloia, Wyong; an extension southwards from Maitland.

Eucalyptus sparsiflora, Mullion Range State Forest, north of Orange; a western extension from the eastern Tablelands and Coast.

Eucalyptus stricta, Doctor George Mountain near Bega; an extension south-eastwards to the coast, and a lower elevation than the Braidwood district and Mt. Wellington in Victoria.

Juncus pauciflorus, Styx River State Forest, in eastern New England; a northwards extension from the Blue Mountains.

Mimulus repens, 38 miles west of Wentworth; an inland extension of a not uncommon coastal species.

Ranunculus papulentus, near Hill End; a northern extension of this species common in the southern districts.

Schoenus ericitorum, Kydra Reefs, east of Cooma; a southward extension on to the Southern Tablelands.

Schoenus maschalinus, Cascade, near Dorrigo; a northwards extension from Sydney and the Blue Mountains.

Naturalised Plants.—The following species have become naturalised in certain areas of the State:—

Aloe arborescens, a succulent, often cultivated in gardens, has become established on granite sea-cliffs at Lager's Point, Trial Bay, south of the mouth of the Macleay River.

Bignonia unguis-cati, "Chicken's-claw Creeper". This native of tropical America has become widely naturalised in rainforest country at Wingham, where it ascends to the tops of the tallest trees in the area.

Celtis australis, the Mediterranean "Nettle Tree", often planted as an ornamental, is naturalised on the banks of the Nepean River at Camden.

Corydalis lutea, a member of the "Fumitory" family commonly cultivated in country gardens, is established in moist sheltered places near Tooraweenah.

Cyperus reflexus, a sedge native to the warmer parts of North and South America, is naturalised on the banks of the river at Parramatta.

Laurocerasus lusitanica, "Portugese Laurel-cherry", commonly cultivated as an ornamental in the cooler parts of the State, has been recorded as naturalised in rainforest at Mount Wilson.

Linaria dalmatica, a native of the eastern Mediterranean, is naturalised in the Armidale district.

Olea europaea, "Common Olive", a species cultivated in this State at times, has become naturalised on Weddin Mountain in the Grenfell district.

Silene alba, has become naturalised in the Dorrigo area.

Tephrosia glomeruliflora, a native of South Africa, is established as naturalised near Lismore.

Tragopogon dubius, a species of "Goat's Beard," native to Europe, is recorded as naturalised in the Cooma district.

Weed Species.—The following species have been recorded as weeds during this year:—

Brassica nigra, "Black Mustard", an annual species native to Europe, has been identified from the Kyogle district and previously from Casino.

Eleocharis dulcis, a sedge native to the northern zone of Australia, has become troublesome in drainage canals in sugar-cane areas on the Tweed River flats.

Gaura parviflora, "Clockweed", a native of North America, has been identified from the banks of the Richmond River near Kyogle. This species is said to be a potentially serious weed on the Darling Downs of Queensland.

Exchanges and Loans with Other Institutions.—Some 2,332 sheets of herbarium specimens were forwarded to twenty institutions. Included in these were special groups of *Juncus*, *Eucalyptus*, and a large number of pteridophytes. In addition to herbarium sheets, some 350 packets of lichens were forwarded to the British Museum on request.

In exchange 3,326 herbarium sheets were received from seventeen institutions. The specimens included 270 pteridophytes from the Arnold Arboretum, U.S.A. A number of these species—collected in Asia, the Pacific Islands and South America—were not previously represented in our collection. Thirty specimens of South African species of *Acacia* were of particular value.

Three hundred sheets of herbarium specimens were received on loan from the Herbarium, Botanic Gardens, Adelaide. Sheets of *Plantago*, *Boronia*, *Nicotiana*, *Halophila*, *Isotoma*, *Oxalis* and *Helichrysum* were loaned to seven other institutions.

Field Collections and Seed Exchange.—The Seed and Plant Collector undertook five major trips. They ranged from five to eleven days' duration, and were to Putty-Pokolbin, Mullion Range, Moss Vale-Nowra, St. Albans-Lake Macquarie, and Eden-Timbilica. In addition, some half-to-two day trips were spent in specific collecting. A total of fifty-nine days was spent in the field, and a mileage of 4,827 was recorded.

Seven hundred and sixty numbers of bulk herbarium material were collected, and 220 bulk seed samples were gathered. Much of the material collected was for exchange purposes, but many specimens were of particular local interest and obtained for study by the botanical staff. These included species of *Grevillea*, *Eucalyptus*, and *Acacia*; *Stipa teretifolia*, *Epacris hamiltonii*, *Archontophoenix cunninghamiana*, *Xanthosia dissecta*, and a number of pteridophytes.

On request, 121 packets of seed, mainly of native species were forwarded to institutions overseas and within Australia. Some of these species were specially required for study or cultivation in foreign botanical institutions. Their collection needed careful search in isolated situations. In exchange, 260 samples of seed were received from overseas and thirty-four from Australian sources. Most of them were of species not represented in our Gardens.

Field Investigations.—A limited number of field trips were made by botanists for studies of *Eucalyptus*, *Juncus* and *Macrozamia* and field relationships of members of the *Acacia ulicifolia*-*A. brownii* group, the *Acacia decurrens* group, and the pteridophyte family *Blechnaceae*, studies of alpine and aquatic species of *Ranunculus*, and members of the family *Restionaceae*.

Research.—The first part of the projected publication "The Flora of New South Wales," submitted for publication in October, 1957, with additional material submitted in June, 1958, and a second part submitted in July, 1958, are still at the printer's office.

Manuscript, for the "Flora," is almost ready for publication on the following families of Pteridophyta: Davalliaceae, Thelypteridaceae, Aspidiaceae, Polypodiaceae and Grammitidaceae. Preparation of manuscript on other families of this group is proceeding.

Manuscript, for the "Flora," on the Angiosperm families Palmae, Araceae and Flagellariaceae has been completed. Preparation of material on the families Restionaceae and Ranunculaceae, and on the genus *Lomandra* is progressing.

An article on the New England flora, to be published in "Contributions from the New South Wales National Herbarium vol. 3, No. 1," submitted for publication in December, 1958, is still at the printer's office.

Miss M. Tindale's paper on "Vein-patterns in *Microsorium scandens* and its Allies" has been accepted for publication in the American Fern Journal. It will probably appear in the September, 1960 issue. The paper deals with the delimits of the genera *Microsorium* and *Phymatodes* which occur chiefly in Asia, Polynesia, and Australia.

Miss M. Tindale completed manuscript on the Pteridophyta for publication in "The Handbook of the Flora of the Central Coast and Tablelands of New South Wales", edited by Professor N. C. W. Beadle, University of New England. It is scheduled to appear during 1960. She also prepared a key to the thirteen bipinnate species of *Acacia* which occur in this district, for inclusion in the same work.

During her visit to the United States National Herbarium at Washington, D.C., Dr. J. Vickery took the opportunity to compare specimens of a number of introduced grasses with American collections. The identities of *Panicum fasciculatum* var. *reticulatum*, *Paspalum quadrifarium*, *Stipa hyalina* and

Stipa brachychaeta, recently recorded as naturalised, were confirmed. *Bromus coloratus* Steud., a native of Argentina and Chile, and *Bromus haenkeanus* (Presl.) Kunth, a native of Chile and Peru, were identified. They constitute new records for New South Wales as naturalised grasses.

Other species of *Bromus* which had been grown in the grass plots at the Botanic Gardens under the incorrect names *B. pendulinus* and *B. pumpellianus* were ascertained to be *B. laciniatus* Beal and *B. erectus* Huds. respectively.

Other grasses grown under incorrect names were identified as *Sporobolus molleri* Hack. and *Sporobolus spicatus* (Vahl) Kunth.

During recent years a number of American species of *Agropyron* have been introduced for testing at various stations in New South Wales, and from specimens received it was obvious that considerable confusion of nomenclature was occurring. Amongst these it was possible to identify or verify *A. pungens* (Pers.) R. & S., *A. semicostatum* Nees, *A. inerme* (Scribn. & Smith) Rydb., *A. elongatum* Host ex Beauv., *A. desertorum* (Fisch.) Schult., *A. trichophorum* (Link) Richt., *A. intermedium* (Host) Beauv., *A. dasystachyum* (Hook.) Scribn., *A. sibiricum* (Willd.) Beauv., *A. junceum* (L.) Beauv.

A special study was made of the genus *Echinochloa* and, although it became evident that a world revision of the genus is required for completely satisfactory results, it was possible to ascertain that the following species occur in New South Wales: *E. colonum*, *E. frumentacea*, *E. crusgalli*, *E. crusgallonis*, *E. oplismenoides*, and *E. pungens* var. *multiflora*.

Work is progressing on a revision of the genus *Poa* in Australia and has reached an advanced stage.

Miss Tindale has collaborated with South African botanists in studying the *Acacia decurrens* group of tanning bark wattles, and has forwarded information on flowering times and seed ripening to the Wattle Research Institute, Pietermaritzburg, to facilitate hybridization experiments. Woodblock specimens have been forwarded to Dr. D. G. Roux, Grahamstown, for biochemical testing, and it is anticipated that a joint biochemical-taxonomic paper will be written by Dr. Roux and Miss Tindale on some species of this complex.

Mr. Johnson continued his studies of the genera *Eucalyptus* and *Juncus*.

All specimens of the woody Australian members of the family Rubiaceae in the herbarium have been checked and re-organised. Some necessary changes in the classification of the genus *Canthium*, in particular, have been made.

The species and forms of the genus *Heterodendron* have been reorganised and some investigations on typification of these carried out.

The correct name for the introduced "Passion-flower", previously known here as *Passiflora alba*, has now been shown to be *Passiflora subpeltata* Ort.

Investigations at the Royal Botanic Gardens, Kew, have shown that the correct name of "Khaki weed" is *Alternanthera pungens* instead of *A. repens* as it has previously been called in New South Wales.

Other information received from Kew has made it possible to identify positively the Australian members of two genera of the family Caryophyllaceae.

The native species of *Gypsophila* is found to be *G. australis*, confined to Australia and New Zealand; this had previously been referred to *G. tubulosa*, a native of Asia Minor.

It has now been made possible to distinguish with certainty between the introduced members of the genus *Kohlruschia*, *K. prolifera* ("Proliferous Pink") and *K. velutina* ("Velvety Pink"), though there are indications that hybridization between them is not uncommon.

Recently published investigations at Bogor, Indonesia, have shown that the species that have hitherto been referred to *Tarrietia* in New South Wales belong to the genus *Heritiera*.

Miss R. Mason, D.S.I.R., Christchurch, New Zealand, recently completed her revision of the genus *Callitriche* and returned our collections which she has had on loan for some years. Her studies (published in Austral. Journal Bot., 1959) have shown that four species occur in New South Wales; whereas only two had previously been recognised, one of them under a misapplied name.

Dr. Vickery's Overseas Visit.—Dr. J. Vickery attended the IXth International Botanical Congress at Montreal in August, 1959, and represented this Herbarium, the Brisbane Herbarium, and the Botany Department, University of Adelaide, at the Nomenclature Sessions. She visited eleven of the major Canadian and United States herbaria and spent about two and a half weeks in taxonomic studies at the United States National Herbarium. She collected over one hundred specimens of American grasses, some of them species not or poorly represented in our collections previously.

Visitors to the Herbarium.—Overseas scientific workers who visited the Herbarium during the year included: Professor R. D. Thorne, Fullbright Fellow from the Iowa State College, U.S.A.; Professor Kuang C. Chow, UNESCO Fellow and Professor of Mechanical Engineering, National Taiwan University, Formosa; Mr. P. Bhatnagar, Colombo Plan Fellow and Economic Botanist, Government of Rajasthan, Jaipur, India; Professor R. E. Holttum, Royal Botanic Gardens, Kew, England; Dr. W. Stewart, Director, Los Angeles State Arboretum, U.S.A.; and Mr. R. Wallace, Entomologist of the Colonial Service, from St. Helena.

Scientific workers from Australian institutions who visited the Herbarium to further their studies included Professor N. C. W. Beadle and Miss B. Paterson, of the University of New England; Dr. R. Story, Ecologist, Miss N. Burbidge, Botanist, and Mr. M. Lazarides, Botanist, from the C.S.I.R.O.; Dr. H. J. Eichler, Botanist, Adelaide Botanic Gardens Herbarium; Dr. W. H. Britten, University of Western Australia; and Dr. Marie Phillips, Botanist, Snowy Mountains Authority.

Determination of Special Collections.—In addition to the many thousands of routine identifications made by the botanical staff throughout the year, certain special collections were also determined. These included some hundreds of specimens

collected in the Hunter Valley by Dr. Story, who is doing ecological work in that area for the C.S.I.R.O.; a large number of pteridophytes collected by Dr. Hoogland, C.S.I.R.O., on Norfolk Island; material of *Marsilea crenata*, collected near Darwin in the Northern Territory, by Mr. G. Chippendale; a complete collection of the family Compositae of the Museum of Applied Arts and Sciences, which contained specimens collected by W. Bauerlin and R. T. Baker in the late nineteenth century; some 200 living specimens of Western Australian wildflowers exhibited in the Sydney Town Hall; and plant material submitted by the Criminal Investigation Branch of the Police Department in connection with alleged criminal offences. Many colour transparencies have been submitted by various persons and bodies for determination.

Lectures and Allied Educational Services.—Lectures, conducted tours of the Herbarium and Royal Botanic Gardens, seminar leadership, radio talks, botanical excursions with groups, and similar educational activities were undertaken by various members of the Herbarium staff on numerous occasions throughout the year.

Service in Various Committees.—The Director and members of the botanical staff served in the following committees during the year: the New South Wales Committee of the sub-committee of the Academy of Science appointed to inquire into National Parks in Australia; the Remembrance Driveway Committee and sub-committee on Special Planning; the Standing Committee on Trees and Forests, of the Men of the Land Society; the Muogamarra Trust; the Technical College Horticultural Advisory Committee; the Linnean Society of N.S.W.; and the sub-committee of A.N.Z.A.A.S. on compilation of an Australian "Flora".



Isolating Plant Parasitic Nematodes from Infested Soil

This battery of nematode isolation units is in the Biology laboratory of the new Science Services building at Rydalmere. Increasing importance is placed on nematodes as agents of plant disease.

AGRICULTURAL RESEARCH INSTITUTE, WAGGA WAGGA

Wheat Improvement

Field Testing.—Thirty-two crossbreds and new varieties were included, with check varieties, in yield trials at five centres throughout the southern wheat belt. Yield levels were higher than in the previous three years, and provided good conditions for selection of high-yielding adaptable crossbreds.

High Yielding Crossbreds.—Olympic, Heron, Glenwari and M.972 (Gular x Dundee x Gular x Bencubbin) were the most consistently high-yielding varieties. Each outyielded the standard Bencubbin.

The consistently good yield record of Olympic suggests that this variety will shortly be recommended as a replacement for Bencubbin. Its baking quality characteristics have been disappointing in comparison with Javelin 48, but superior to Bencubbin.

The 1959 results confirmed the high yielding ability of M. 972. In nine trials it proved superior to all named varieties in baking tests. Approximately 300 bushels of pure seed were secured and this will be increased with fifty Registered Seed growers during the 1960 season. While resistant to flag smut, M.972 is susceptible to stem rust. Back crossing for the incorporation of stem rust resistance is in progress.

Breeding for Quality.—Back cross programmes aimed at improving the quality of Bencubbin and Glenwari have been carried through a further stage. Progress has been made in improving the sieving tests as a supplement to the Pelschenke test in evaluating crossbred material. A drift in values of the sieving test has been found to be associated with changes in atmospheric humidity.

Breeding for Disease Resistance.—With Heron, Insignia, Dirk and Javelin as recurrent parents, a number of new strains possessing combined resistances to several diseases have been produced.

Triple stem rust resistance from the Kenya wheats C. 6040, C. 6041 and C. 6042 has been incorporated in the varieties Javelin and Dirk. Additional resistance from *Triticum timopheevi* and *Agropyron* is being used to supplement that already obtained. In this way it is hoped to confer a more lasting resistance to the commercial varieties of New South Wales.

Preliminary tests of wheat-rye material for resistance to "take-all" (*Ophiobolus graminis*) were unsatisfactory. They point the need for more effective screening methods.

Genetic Studies.—Three races of powdery mildew (*Erysiphe graminis tritici*) have been used in a genetic analysis of a number of mildew resistant wheat varieties. This has led to the detection of six genes for resistance; designated M_{1a} , M_{1b} , M_{1c} , M_{1d} , M_{1e} and M_{1f} . Four genes have been transferred to the variety Federation to produce "tester" lines. These lines will be particularly useful in the determination of physiological races.

Isogenic lines of red and white-grained Javelin have been used to demonstrate a close association between grain colour and dormancy.

Cold Resistance.—Results over several years have shown that varietal differences in frost resistance at late stages of growth can be demonstrated under controlled conditions, using several different techniques. There is some hope that the behaviour of excised stems from field-grown plants will sufficiently correlate with whole plant reactions to be useful as a selection method.

Funds allocated by the N.S.W. Wheat Industry Research Committee will permit detailed examination of major aspects of the problem.

Wheat Disease Studies

Survival of Cereal Root Rot Fungi.—Preliminary results in survival studies, with cereal root rot fungi (*Ophiobolus graminis*, *Fusarium culmorum*, *Helminthosporium sativum* and *Curvularia ramosa*), indicated that these fungi are better able to survive in soil maintained at a fixed moisture content in the laboratory than in soil under natural field conditions.

Subsequent results have shown that this generalization does not apply if the survival sampling period is characterized by extended spells of hot dry weather. Enhanced field survival under such conditions is believed to reflect an associated decline in the activity of the soil microflora.

Colonization of Cereal and Grass Straw by Root Rot Fungi.—Further studies have confirmed that, in competition with the microflora of unsterilized soil, *Fusarium culmorum* and *Curvularia ramosa* behave as vigorous saprophytic colonizers of straw (sterilized or unsterilized) of cereals (wheat, oats and barley and grasses (*Phalaris tuberosa*, *Hordeum leporinum* and *Lolium rigidum*). Under comparable conditions *Ophiobolus graminis* and *Helminthosporium sativum*, though occasionally recorded as colonizers of sterilized cereal and grass straw, have not yet been recovered from natural unsterilized straw buried in soils known to contain these fungi.

Barley Yellow Dwarf Virus Disease.—Collaborative work with the C.S.I.R.O. was continued. Field studies established the occurrence of the disease in commercial cereal crops in southern N.S.W. during the 1959-60 season. Little infection was observed in wheat crops, but some early-sown oat stands were seriously affected. *Rhopalosiphum padi* proved to be the aphid species most commonly associated with the development of BYDV under local conditions. *R. maidis* and *Macrosiphum avenae* s.sp. *miscanthi* were also recorded as vectors.

Wheat Quality Investigations

Milling and Baking Tests of Breeders' Material.—Milling and baking of all breeders' material in the short period between harvest and sowing fully occupies the testing facilities.

Test baking remains the principal means of quality assessment of advanced material. While this service must be maintained as an integral part of a wheat-quality breeding programme, every endeavour is being made to find more rapid alternative means of quality assessment, even if they only reduce the quantity of material for milling and baking, by screening off those samples which do not warrant fuller testing.

With that as the aim, the milling and physical dough characteristics of all lines are being analysed and the results are being correlated with baking quality.

The connection between certain physical dough characteristics and baking quality also show promise as a means of eventually eliminating some of the present subjective assessment associated with test-baking.

Analyses in Relation to Starch Damage.—The study of factors influencing susceptibility to starch damage during milling, and the influence of varying degrees of damage, on both physical dough testing and baking quality, is being continued. This is so in respect both of breeders' material, submitted for routine quality testing, and wheat varieties from field trials covering the widest range of types. The latter material provides means of studying nitrogen and carbohydrate metabolism during maturation of the grain.

The Buhler laboratory mill has contributed to the study of the varietal effect on damaged starch, by eliminating the milling variable associated with the manually-operated mill formerly used.

Oat Improvement

Promising Crossbreds.—Several promising crossbreds have been compared with the standard recommended varieties, to determine grazing yields and recovery for grain production. New trials were established in the southern area at Henty.

The crossbred M. 1010 again performed well. With its superior qualities of smut resistance and strong straw, it is likely to replace Fulghum as a dual purpose oat.

M. 1059 proved superior to Burke in both grazing and grain production.

Oat Grain Varietal Characteristics.—Descriptions have been made of the grain characteristics of standard oat varieties. They are being used as a means of identifying the varieties.

Sowing Time and Grazing Management in Relation to Grain Yield.—A study is being made of the influence of sowing time and grazing management on the grain yield components of 16 oat varieties. In this way it is hoped to understand more precisely the factors responsible for the adaptation of those varieties to varying environmental conditions.

Pasture and Weed Investigations

Subterranean Clover Studies.—Field trials over a four year period show a tendency for better survival of early strains under marginal conditions.

The possibility that the Marrar, Burnley and Woogenellup strains are identical is being investigated.

Skeleton Weed in Relation to Wheat Cropping.—Reduced competition brought about by fallow spraying tends to improve yield by increasing crop density, spikelets per ear, and grains per ear. Grain weight is usually not affected. However, the seasonal moisture regime has been found to be a major factor in determining the efficiency of both fallow and pre-heading sprays.

The new herbicide "diqout", and C.M.P.P., were more effective than 2, 4-D when used as fallow sprays in 1959.

Lucerene and Phalaris Establishment.—Problems associated with establishment of lucerne and *Phalaris* pastures are being investigated.

Soil Fertility Studies

Phosphate Status of Soils of Southern Wheat-belt.—Further evidence from field trials indicates that moisture stress is more important than extremely low soil phosphorus or nitrogen levels, in restricting grain yields in southern New South Wales.

Dr. J. D. Colwell's resignation to take up an appointment with the C.S.I.R.O., Division of Soils, has resulted in temporary cessation of the work on soil phosphate status.

Factors Affecting Protein Content of Wheat.—Work designed to differentiate between the effects of climate, soil fertility, and management, on the protein content of wheat, has continued. Measurement of these effects separately is complicated by the fact that they are all so closely inter-related.

Contact made with many farmers has yielded some valuable information, but the degree of success in planning continued cropping programmes on selected sites has been disappointing. This has mainly been due to seasonal and economic conditions.

Soil Nitrogen Levels in Relation to Wheat Crop Weeds.—A programme commenced in 1959 to study the levels of available mineral nitrogen under a growing wheat crop, in relation to the needs of the crop, has been continued. Results for 1959 indicate that the fertility improvement brought about by clover ley farming can more than satisfy crop requirements for nitrogen in some years.

An attempt is being made to determine the most suitable method, if any, of storing soil samples for subsequent analysis in terms of non-organic nitrogen. Preliminary results show that toluene suppresses any change in nitrate levels, but markedly increases ammonia content. Storage under deep freeze conditions appears, at the moment, to be the most satisfactory method.

Soil Fertility—Wheat Variety Interactions.—A programme has been initiated to study soil fertility—wheat variety interactions. It comprises a series of field and pot trials.

Field trials have been laid out to study the rate of build-up of soil fertility by subterranean clover and wimmera rye grass pastures under different conditions of top-dressing and management.

DIVISION OF MARKETING AND AGRICULTURAL ECONOMICS

State Marketing Bureau

Marketing Boards.—The several Marketing Boards constituted under the provisions of the Marketing of Primary Products Act, 1927-56, continued to function. Boards in operation comprise the Egg, Rice, Navy Bean, French Bean Seed and Wine Grapes Marketing Boards. Action to wind up the affairs of the Potato Marketing Board (in liquidation) was continued but finality has not yet been reached.

Action was taken to appoint two new Ministerial nominees, to fill a vacancy on the Wine Grapes Marketing Board (due to a resignation) and one on the Navy Bean Marketing Board (due to the death of a former nominee). A nominee on the Rice Marketing Board also resigned. Action to fill this vacancy is proceeding.

Amendments to Regulations.—General regulations under the provisions of the Marketing of Primary Products Act, 1927-56 were amended to provide for:—

Payment of increased sustenance and meal allowances to members of all boards constituted under this Act.

Payment of increased annual allowances and increased fees for attendance at meetings in respect of members of the Egg Marketing Board.

The qualification of honey producers for voting purposes.

Regulations covering the operations of the Egg Marketing Board were amended to provide for compulsory registration of poultry flocks comprising twenty or more adult female fowls.

Regulations in respect of the Navy Bean Marketing Board were amended by a new statement of the periods of time prescribed for computing payments to growers.

Polls and Elections.—Polls held under the Marketing of Primary Products Act covered election of producer representatives, dissolution of a Board and Constitution of a Board. Particulars were as follows:—

- Triennial election of five producer representatives to the Wine Grapes Marketing Board.
- Triennial election of three producer representatives to the French Bean Seed Marketing Board.
- A poll on the question of dissolution of the French Bean Seed Marketing Board, following a petition requesting such action. The proposal was narrowly defeated, and the Board will continue for at least a further three years.
- A poll on the question of constitution of a Honey Marketing Board, following a petition from honey producers. The proposal to establish a Board was narrowly rejected.

Plebiscite of Banana Growers.—At the request of the Banana Growers' Federation of New South Wales, the Division conducted a plebiscite to determine whether banana growers desired the Federation to take action to limit the quantities of fruit being marketed during periods of heavy production. The growers' vote proved to be not in favour of such a scheme.

Consideration of the question of banana marketing is continuing. The industry, in co-operation with the Division, is examining proposals either to amend the Marketing of Primary Products Act or to recommend the enactment of special marketing legislation more suited to the requirements of this industry.

Market Reports and Related Services.—As required under the provisions of the Marketing of Primary Products Act 1927-56, the Division continued to collect and publish information relating to the marketing of livestock, fruit, vegetables, farm produce, fish, dairy produce, cut flowers, and certain processed products.

Daily reports covering all aspects of trading operations at the various wholesale markets in the Sydney metropolitan area were prepared for broadcasting over the National network of the Australian Broadcasting Commission and several commercial radio stations; and for publication in the Division's *Daily Wholesale Price Quotations* issued to newspapers, periodicals, Federal and State Government Departments and instrumentalities and producers' organizations, etc.

The Division continued to prepare special marketing reports for broadcasting. These reports covered products from the Murrumbidgee Irrigation Areas, and interstate products, for the Australian Broadcasting Commission's country and interstate network. In addition to the Australian Broadcasting Commission, Commercial Stations 2UE Sydney, 2RG Griffith and 2WG Wagga now make use of the Division's market reporting service. The two latter stations receive reports specially prepared to cover local requirements. The Macquarie Broadcasting Service has relinquished broadcasting of the Division's general State report.

An improvement in the markets' staff position enabled the Division to resume its retail price collection work. This service has been extended to cover the collection of retail meat prices as well as those relating to fruit, vegetables and fish.

The Weekly Marketing Notes continued. This publication includes reports on the stock sales at Homebush (cattle, sheep and pigs) and reports on prices and supplies of fruit, vegetables, meat, fish, poultry, grain, miscellaneous farm produce and processed products.

These Notes also included cold storage statistics collected in respect of eggs, butter, cheese and fruit; and a series of average monthly prices covering a comprehensive range of farm products, computed from the Divisional records.

Stock feed prices on a wholesale and retail basis were collected monthly.

Compilation of statistics relating to arrival of primary products at Sydney by rail and sea, both from interstate and intrastate sources, continued.

Inquiries concerning prices and market prospects, covering an extensive range of primary products, were received from a wide variety of local and overseas sources—State and Federal Departments, banks, processors, trade agencies, growers' organizations, and individual producers.

Crop Reviews and Forecasts.—This service continued. Forecasts of production were prepared for wheat, oats, broom millet, and citrus fruits. The monthly report formerly known as the *Review of Grass Conditions and Pastoral Outlook* is now published under the title of *New South Wales Pastoral Conditions*. The *Report on Production Trends* was also continued on a monthly basis.

Meteorological Services.—An officer of the Division continued to act as the Department's representative in the State Climatological Committee of New South Wales and as liaison officer between the Department and Sydney Weather Bureau.

The Division continued to maintain comprehensive meteorological records and data. Meteorological advice and data were provided for the use of officers of various Divisions of the Department and members of the public; particularly in relation to rainfall as affecting farming pursuits in various districts, and the Division's Crop Forecasting Services and Review of Pastoral Conditions.

The Division assisted in liaison between the Department and the C.S.I.R.O. in connection with the latter's cloud seeding and rainmaking experiments in the Warragamba Catchment Area.

Economic Research

Shortage of Research Economists.—The Division's economic research programme continued, but in a severely restricted form. This restriction arose from the impossibility of recruiting suitably trained research staff to replace experienced research economists lost during the previous year. Further resignations occurred during the current year and, while there was no further net reduction in the Division's research staff, the further loss of experienced workers continued the adverse effect on the Division's research programme. Even so, since some staff was recruited, it has been possible to commence some important new research projects.

The Division continued to receive numerous requests for research on a variety of economic and management problems. Many of these would involve field surveys, but because of the adverse staff position most of the requests had to be refused. Work on one major research project was halted almost completely owing to the loss of research staff.

Main research projects, completed during the year or in progress at the end of it, are as follow:—

Southern Tablelands Regional Research and Extension Study.—Very little further work was done on this major study. Some tabulation and interpretation of material collected in the 1957 field survey were completed and made available to the Joint Planning Committee responsible for the work.

Arrangements made with the University of Melbourne for the former officer of this Division—previously responsible for this study—to continue work on it during 1959-60 did not materialize. However, undertakings have been given that further work will be done on this study at the University of Melbourne by the end of 1960. Other arrangements are also being made for completion of the tabulation and assessment of the field survey material.

Irrigated Land Use in the Southern Murray Basin.—For a period, research continued into the problems of production instability in south-eastern Australia and the contribution of integration—between irrigated land use and farming in non-irrigated areas—towards meeting the problems. The work had to cease when the Special Economics Research Officer (Irrigation) concerned with it resigned from the Division to take up an appointment with the University of Sydney.

Arising from this research, two further articles were published in the *Review of Marketing and Agricultural Economics*. They were "Integration of Irrigation and Dryland Farming in the Southern Murray Basin—Part II: Results of Research in a 'Field Study Area' 1956-58" and "Part III: The Evolution of Integration and Some Lessons for the Future".

Farm Management Study—Nowra District.—In this project a group of dairyfarmers in the Nowra district are keeping detailed records of their farming operations and finance. The records of the group of farmers who participated in the first year of this study (1958-59) were analysed, and the results were published in processed form in October, 1959.

Data from this study have proved helpful not only to dairymen but also to extension workers, bankers and valuers. The number of farmers in the group has been increased slightly and the work will be continued in 1960-61.

Demand Studies for Fruit and Vegetables.—Research on the demand for fruit and vegetables continued. The analysis of demand for pineapples, referred to in the previous Annual Report, was completed. Results were published in the *Review of Marketing and Agricultural Economics*.

Demand for peas and beans were also analysed and the results were published in the Review.

As with bananas, it was established that the wholesale prices of pineapples and also of peas had failed to rise during the past six years despite considerable increases in the cost of production and a decrease in the purchasing power of the producers' income.

In respect of beans, the study revealed that, in the Sydney markets, average prices of beans during the winter months had fallen sharply from in excess of 30s. per 12 lb. in 1955 to little more than 10s. in 1958 and 1959. Part of this reduction was due to an increase in supply, but it was demonstrated statistically that largely the price fall must be explained by a falling off in demand.

Historical Study of the Fruit Industry.—A detailed historical study of the development of the Australian fruit industry with particular reference to New South Wales, and with emphasis on dried fruit and citrus production and marketing, was prepared. It was published in the *Review of Marketing and Agricultural Economics*. The study described, in particular, the early development of Marketing Boards and their influence on Australian thought about the marketing of primary products.

Economics of Pasture Improvement.—A major new research project concerned with the economics of pasture improvement was commenced. It aims to bring up-to-date the work done in earlier years by this Division, to supplement work done by other organizations, and to provide basic new information.

This project will provide valuable information for extension workers and farmers, on the costs of and returns from pasture improvement. The results should also prove valuable in indicating optimum sequences of development in pasture improvement over a time, the most profitable rate of introducing improved pastures onto wheat-sheep farms, and the most economic combinations of enterprises for wheat-sheep or cattle-sheep farmers operating under conditions of uncertainty.

The study should also throw some light on general related aspects—such as farmers' decision processes, risk aversion, capital rationing and attitudes to borrowing and credit.

Farm Investment Study.—Another important project initiated this year was a study of farm investment. Broadly, it aims to provide information relating to investment problems associated with farming and farm establishment generally.

Selected farms will be investigated with a view to ascertaining capital requirements. Problems encountered in developing the property, the methods of overcoming them, and the methods of financing development programmes will be examined. The effects, on farm investment and development, of seasonal conditions, prices, and the farmer's age, education and previous experience, will also receive consideration. There is a severe lack of specific information of this nature.

Results of the study would help in management decisions by farmers and/or their advisers; this would also be very useful in formulation of land settlement policy and would facilitate answers to inquiries from persons wishing to establish themselves in farming.

Survey of Potato Marketing.—The Sydney potato market is being studied. Results will be published late in 1960.

Export Markets for Bananas.—The results of an investigation of possible export markets for Australian bananas are not conclusive. In most markets, prices are too low to be attractive to the Australian producer. However, there is a distinct possibility that a market for Australian bananas may be established in western Canada. Inquiries are being continued.

Advisory, Educational and Extension Activities

Policy Advice.—The Division continued to provide advice on economic policy affecting agriculture. It also continued to examine and advise on the position concerning import and export of coarse grains, protein concentrates and other farm requisites.

Report on Meat Supplies and Prices.—On the instruction of the Minister a report on meat supplies and prices was prepared by the Chief of the Division, following a detailed investigation of causes of the upward movement in meat in the disposal of surpluses, over and above the full satisfy-

The report, released by the Minister in February, 1960, contained a detailed assessment of trends in the Australian beef industry. It included particular reference to the effect of export of low quality beef to the United States. This assumed substantial proportions in 1959. The position in respect of mutton and lamb was also reviewed.

The report concluded that "with Australia's increasing cattle numbers, and the maintenance of favourable seasonal conditions both in this State and to the north, there will be ample supplies of beef available for local needs. In respect of mutton and lamb supplies, the problem that lies to the future will be in the disposal of surpluses, over and above the full satisfying of local consumption needs."

Quarterly Journal.—The Division continued to publish its quarterly journal, *The Review of Marketing and Agricultural Economics*. A high standard has been maintained. Papers from agricultural economists employed in other organizations are accepted for publication in this journal. In particular, the Faculty of Agricultural Economics, University of New England, has submitted papers for publication in it.

Lectures at Extension Schools, etc.—As in the past, officers of the Division addressed numerous extension schools organized by the Department, and by the Agricultural Bureau, other farmer organizations and universities. Officers also addressed various professional societies and other organizations on economic aspects of the rural industries.

Demand for talks on economic subjects by officers of the Division is increasing. Because of the depleted staff position it has not been possible to comply with all requests.

Lecture Courses at Agricultural Colleges.—The Division has provided a lecturer in Agricultural Economics at Wagga Agricultural College since inception of the College. This arrangement continued in the past year. It also assisted the lecturer in Agricultural Economics at Hawkesbury Agricultural College. The Division continued to be responsible for examining in Agricultural Economics at each of these colleges.

Representation on Committees

The Division of Marketing and Agricultural Economics had been represented in the Advisory Panel of the Hunter Valley Research Foundation. In particular, it participated in activities of the Foundation's "Land Use" and "Economic Research" Committees.

The Division continued to provide the Executive Officer for the State FAO Committee. During the year the Director-General of FAO, Dr. B. R. Sen, visited Australia. His entire itinerary during his visit to New South Wales was arranged by the State FAO Committee.

Mr. G. E. Mulgrue, FAO Regional Information Adviser in Bangkok, visited Australia on a lecture tour. His itinerary in New South Wales was arranged by the State FAO Committee.

Officers of the Division also acted as Departmental representatives in the State Mapping Advisory Committee, the State Nutrition Committee, the Markets Advisory Committee, and the Joint Planning Committee for the Southern Tablelands Regional Research and Extension Study.

Visit of Chief of Division to North America and Europe

The Chief of the Division, Mr. C. J. King, visited North America to study the operation and organization of meat marketing in the United States and Canada. This was late in the financial year under report. Subsequently, he was to visit the United Kingdom and continental Europe on behalf of the New South Wales Egg Marketing Board.

DIVISION OF INFORMATION SERVICES

Editing Services

The editing section produced the monthly *Agricultural Gazette of N.S.W.*, the monthly *Poultry Notes*, the bi-monthly *Dairy Topics*, the weekly *Press Copy*, the miscellaneous *roneoed news releases*; maintained—through reprints, revisions and additions—a range of near to 700 miscellaneous booklets, pamphlets, etc., and produced special handbooks, programmes, and reports, for short-term schools, conferences, field days.

Agricultural Gazette of N.S.W.—Circulation of this monthly (96 pp., illus., including 42 pages of advertising and four-colour cover), increased from 34,500 to 34,900 per month. Delays in publication were largely overtaken in the first few months of the year.

Poultry Notes.—Circulation is 5,900 a month, an increase by 100.

Dairy Topics.—Financed by the Dairy Industry Extension Grant, this journal was despatched at two-month intervals to 18,550 addresses—in effect all dairy farmers and dairy factories.

Booklets, Pamphlets, etc.—One hundred and seventy-eight publications were sent to the printer after editing attention, 28 more than in the preceding year and 110 were received from the printer, 52 less than in the preceding year.

Press Copy.—Circulation of this weekly was in the vicinity of 1,200, as in the previous year. Primarily it is for use by newspapers and radio stations, of which there are some 400 in the mailing list. Four hundred and seventy-one items and twenty-four illustrations appeared in *Press Copy* including forty-four items of women's or farm home interest.

Stereo Loans to Newspapers and Journals.—One hundred and thirty-nine loans of stereos were made in this service, based on blocks used in the weekly *Press Copy*. The illustrations comprised photographs, diagrams and maps.

Roneoed Press Releases.—Sixty press statements were stencilled, roneoed and despatched, involving the assembly and enveloping of 13,974 roneoed sheets. The total of 60 statements contrasts with 91 in 1958-59 and 143 in 1957-58. Most of such releases are copy received from the Ministerial office.

Farmer Handbook Volumes.—The immediate goal is two volumes, viz.: "Weeds" and "Pastures". The "Weeds" volume (374 pp., 82 colour plates, plus black and white illustrations) has been on sale since December, 1959.

Using funds advanced from the Commonwealth Extension Services Grant and Dairy Industry Extension Grant the edition (5,000 copies) has been purchased from the Government Printer for £4,554. This expenditure, plus £1,200 earlier advanced to the printer for colour-plate blocks made by a sub-contractor, means that the costs for printing averaged approximately 23s. per copy for the first edition of 5,000 copies. The formal retail price is 42s. (plus 2s. 5d. for postage), but discounts of 10 per cent, 20 per cent, 25 per cent, 33½ per cent apply in appropriate sets of circumstances.

In the first six months of availability of the book, more than 2,500 copies have been dispersed and the revenue to date is near to £5,000. Shortly the revenue will be in excess of the £5,754 paid to the printer.

Total revenue from the first edition alone will in due course have made a substantial contribution to the salary of the author (Mr. J. N. Whittet). The revenue is paid into a Special Deposits Account, to reimburse the Commonwealth Grants (the N.S.W. share) from which the production was financed.

Productions of the "Pastures" volume is well advanced. All eleven chapters have been treated, but each requires further attention. It is anticipated that the book will be ready for the printer in the first half of 1961.

Colour-plate Insect Pest Pamphlets.—A series of fifty single-sheet pamphlets (colour plate on one side, and treatment directions on the reverse) is in production. Costs of the series are being met by the Commonwealth Extension Services Grant. The first batch of eight has been in distribution since June, 1959. This batch has also been reproduced in the *Agricultural Gazette*, two per issue, from February to May, 1960.

The printer has delivered proofs of the second and third batches, each comprising eight pamphlets. Ten thousand of the second batch are at present being printed. Entomology Branch is checking the proofs of the third batch.

Former Entomologist Mr. E. H. Zeck, the artist for the series, is to provide block copy for twenty-six more pamphlets.

Advertising Revenue.—Revenue from space in the *Agricultural Gazette of N.S.W.* has exceeded £12,000, compared to a little more than £10,000 in the preceding year. The increase was largely due to production of two more issues of the *Gazette* (13 vs. 11) by the printer, in overtaking the lag in publication dates. Revenue from space in *Poultry Notes* was £162, as in 1958-59. Revenue from space in miscellaneous booklets has been £690, as against £476 in 1958-59. Overall revenue from advertising space exceeded £13,000.

Enquiry Section and Publication Distribution

Enquiries.—Excluding those handled by the Home Gardens Enquiry Officer (6,647 reported in a later paragraph) this section handled with the aid of literature available for distribution some 94,768 requests for information, compared with 84,487 in 1958-59, 78,314 in 1957-58, and 87,687 in 1956-57.

No record was kept of at-the-counter requests handled in the Department's Information Bureau at the Showground during the ten days and eight nights of the R.A.S. Show, but the total there would run into many thousands.

Distribution of the 94,768 requests—per phone, per letter and at-the-counter, was recorded as 19,356 per phone, 27,108 by post and 48,304 at the counter.

Publications Distribution.—963,436 items of literature were dispersed, compared to 1,067,525 items in 1958-59, 893,460 in 1957-58, and 891,301 in 1956-57. The total of 963,436 included 217,844 items despatched in parcels to country offices for decentralised distributions, compared to 281,540 in 1958-59.

Saleable Publications.—Revenue from saleable publications has been in the vicinity of £6,000, compared with £539 in 1958-59, and £638 in 1957-58. The big increase has of course been due to the "Weeds" book. This accounted for near to £5,000, through disposal of more than 2,500 copies. The other sales comprised some 3,200 items, spread over 24 titles, compared with 3,331 items spread over a similar range of titles in 1958-59. Only about 3 per cent. of the titles in the department's range of literature represent saleable literature.

The foregoing paragraph does not take into account the Government Printer's revenue from subscriptions (12s. p.a.) to the monthly *Agricultural Gazette of N.S.W.* The Printer maintains that subscription mailing list and the associated records.

Home Garden Enquiry Officer's Services.—The H.G.E.O., stationed in the Enquiry Counter Section, maintains a separate record of enquiries referred to him. It is a measure of the volume of enquiries which—in the absence of his position—would have to be passed on by office assistants in the Enquiry Room to subject-matter officers in other divisions. His records for 1959-60 show that he handled 6,647 requests, compared with 7,452 in 1958-59 and 9,000 in 1957-58. The distribution, per 'phone, per letter, or in-person, was 3,283 per phone, 1,292 by post, and 2,072 in-person.

Library Services

Staff and Allied Matters.—Some major staff changes occurred.

Mr. E. H. Wilkinson, central librarian for the past five years, resigned to take up appointment as Reference Librarian at the University of N.S.W. His successor is Mr. J. Hazell from the Public Library staff.

Librarian establishment remains at eight officers—provided on secondment by the Principal Librarian of N.S.W. All positions currently are occupied.

The part-time service to Department of Conservation library has been placed on a full-time basis by the Principal Librarian of N.S.W., releasing for full-time duty in Department of Agriculture libraries the 50 per cent of time of an officer formerly required to attend both.

A librarian has been released for full-time service in the now aggregated libraries of Biology, Entomology and Chemistry Branches of the Science Services Division in the new building at Rydalmere. Formerly these science branch libraries at head office were given part-time service.

The librarian in the National Herbarium branch library has been assisted one day per week by a librarian from head office library, to overtake cataloguing arrears.

Full-time library service has been maintained at Hawkesbury Agricultural College, and also for the Division of Animal Industry and Glenfield Veterinary Research Station branch libraries.

Part-time assistance has been provided for branch libraries in Division of Marketing and Agricultural Economics, and Division of Dairying.

Library Accessions.—13,823 items (books, periodicals, bulletins, reports, etc.) were accessioned, compared with 14,383 in 1958-59 and 14,658 in 1957-58:—

Books accessioned	326
Periodicals accessioned	10,705
Bulletins, Reports, etc., accessioned	2,792
Total accessioned	13,823

Of the 326 new books, 88, by using Commonwealth Agricultural Extension Grant funds, were acquired for location in country offices affecting extension services. There are now select collections of books in 73 country offices, in all, comprising 1,405 books and 151 titles.

Agricultural Colleges' Book Purchases.—In addition to aforementioned book purchases, 72 books for Wagga and 86 for Hawkesbury Agricultural College libraries were ordered against special trust accounts derived from student contributions.

Central Library Loans.—28,294 items were loaned, compared with 28,754 in 1958-59 and 27,572 in 1957-58.

Periodicals circulated .. 25,059 (av. 462 per week)

Miscellaneous loans ... 4,235 (av. 81 per week)

Periodical "Select List of Publications Received".—This list was sent to all appropriate officers/offices—country and head office. It typically comprised some 20 pages of classified references. Four roneoed issues were despatched.

Photo-copying Service.—432 jobs were completed, comprising 4,851 sheets, compared with 692 jobs comprising 4,197 sheets in 1958-59. The reduced number of jobs and the increase in sheets indicate that more multiple-copy jobs were undertaken, and that individual jobs involved more pages than in the previous year.

Reference Work and Searches.—These activities, on behalf of departmental staff, external organisations, and the public, comprised an important contribution to the availability of information from literature. The help of the Research Service of the Public Library of N.S.W. was sought, for supplementary information. Certain subjects are best dealt with by that service, in many instances previous literature searches had been made on relevant topics, and thus it was possible to use reference lists already compiled.

A record of enquiries subject of research is now included (from June, 1960) in the Divisional section of the Department's monthly report. The report is widely circulated. Thus, many officers interested in similar topics will have access to the information.

Inter-Library Loans.—There has been continued co-operation with libraries of other organisations. The Department's library has loaned more than it has borrowed, but has gained by way of first consideration for duplicate items of agricultural interest held by other libraries. The work involved is, in any case, one of the most useful means of contributing to the national spread of agricultural information for research and advisory uses.

Display Art/Designing Services

Aid to Editing Section.—The display artist-designer has aided the editing staff by photographic retouchings for block-copy, and by cover designs and layouts.

Lecture Aids, etc.—He has helped extension officers of other Divisions with lecture aids—charts, graphs, drawings; has written captions and signs for the photographic aids section and title frames for ciné film footages.

Show Exhibits and other Displays.—He has helped country offices with show exhibit designs, signwriting, ticket writing, illustrations and packaging and despatch of display equipment.

Show exhibit assistance has been given to each of the nine agricultural regions. In all, exhibits at some 30 country shows were helped by his work.

A major project comprised the Department's information bureau, film theatre and two display bays in the Agricultural Pavilion at the 1960 R.A.S. Show, Sydney.

Photographic Aids Services, Cine and Still

Technical Officers' 35-mm. Photography.—There are now 120 x 35-mm. cameras registered in the department's photographic system, and 95 per cent. of them are in country offices as extension aids. The photographic outcome is channelled through this division en route to the processors and, again, en route from the processors back to the field. Tutorial comment has been forwarded by the Photographic Aids section to the individual officers in all cases warranting advice.

Outcome of technical officers' photography this year has been 8,800 colour slides, compared with 6,960 in 1958-59, and 6,174 black and white slides, compared with 6,510 in 1958-59.

Tutorial Letters.—In excess of 600 letters have been sent, to help improve field officers' photography, compared with 490 in 1958-59 and 459 in 1957-58. The increase is accounted for by more officers actively using the cameras, and a more complex range of subject matter attempted.

Tutorial Sessions.—The photographic aids officer has conducted teaching sessions at the department's in-service Extension Methods training school, and at three pre-service schools by this division for University of Sydney and University of New England undergraduates in agriculture or rural science. He also spent advisory periods with groups of officers and individuals at their respective field headquarters.

Prints to Illustrate Publications, Reports, Records.—1,828 prints were made, or secured through the Government Printing Office to illustrate officer's writings or technical records.

Use of Photographic Aids in Show Displays.—Enlargement prints or transparencies, many of them hand-coloured, were supplied for extension displays at some 30 agricultural shows or other exhibits. Most were derived from field officers' 35-mm. colour slides or black and white negatives.

Special Sequences of 35-mm. slides.—Some special sequences were printed, mounted, and captioned, for extension usages. They comprised "Reproduction in Ewes", "Climate v. Vegetation Maps", "Pruning", "Fruit Varieties", "Hydatids", "Liver Fluke", "Silage Making", "Cotton Varieties", "Serrated Tussock Control", "Wheat Breeding", "The Dairy Cow", and others.

Special Photography for Farmer Handbook Volumes.—A total of 400 photographs, indoor, of plant species and seeds, has now been reached in the special photography for blocks in the "Weeds" and "Pastures" volumes of the Farmer Handbook series.

Central Library of Photographs.—Some 268 new registrations were made, comprising selections from field officers' black and white negatives; 66 less than in 1958-59.

16-mm. Ciné Film Production.—All ciné film colour footage needed for the "I.B. in Cattle" film has now been acquired. Editing is proceeding.

Treatment and script for a film "Pick-up Baler Maintenance" were prepared in collaboration with mechanisation officers. The film was produced in due course by the Department of Interior Film Unit, for the Department of Primary Industry, as an expenditure under the Commonwealth Extension Services Grant.

A film "Animal Nutrition and Pasture Utilisation", based on Shannon Vale Nutrition Station work, is in production through the same channels.

A short film showing disease symptoms in dairy calves was prepared for Division of Animal Industry.

Cine Film Library

Films Total.—Eleven films were added to the film library, bringing the total to 220 titles.

Liaison with Other Libraries.—The Department's film holdings are supplemented in extension service by films from other libraries. To this end, liaison has been maintained with the New South Wales Film Council, and the various Consulates, Information Offices, and commercial firms which hold films. Many of the district offices and the Agricultural Bureau Branches are also registered direct borrowers from the New South Wales Film Council, the largest film library in this State.

Collation and Loan of Film Programmes.—The Department's film library collates programmes and loans them to about 100 borrowing centres—field offices and Agricultural Bureau branches. This year 1,298 films in 627 programmes were loaned; compared with 1,704 films in 691 programmes in 1958-59 and 1,852 films in 662 programmes in 1957-58.

There has been a desired trend towards fewer films per programme; indicating better use of films, as extension aids rather than as entertainment. The average of films per programme declined to little more than 2.0; compared with 2.5 in 1958-59 and 2.8 in 1957-58. Almost all borrowings are now for active teaching use, with the extension officer and the audience involved in discussion of the film's subject matter.

The 1,298 film loans necessitated manual checking of 957,000 ft. of film, and repairs where needed.

Film Appraisal Screenings.—The Division arranged thirty-five appraised screenings; compared with twenty in 1958-59 and seventeen in 1957-58.

The appraisal screenings allow subject-matter officers of various Divisions to assess the extension potential of newly-available film in extension service, or such other action as appears desirable.

Some other libraries have used this Department's appraisals as a guide in deciding distribution of new agricultural films. Also, officers of this Division maintained contact with the Film Users Association and the Scientific Films Society, for help in pre-selection of films likely to be worth Departmental appraisal screenings.

Radio in Extension Service

Farm Broadcasts.—Thirty-one country radio stations now broadcast farm programmes in which Department of Agriculture officers feature at least weekly. Some stations involve Departmental officers twice- and others thrice-weekly. Some 2,750 separate broadcasts were made in the past year by officers.

Tutorial Work by Extension Officer (Radio).—The radio specialist in this Division has visited six of the nine Agricultural Regions for tutorial work amongst field officers and for liaison with radio stations. He also conducted teaching sessions at the Department's Extension Methods in-service training school, and pre-service schools conducted for the Universities of Sydney and New England.

Voice use, choice of topics, programme format, practice interviews, and equipment operation were subject of tutorial work.

Liaison Visits to Radio Stations.—Twenty country radio stations were visited by the specialist. He reported that almost without exception the stations praised the programme supplied from Departmental resources, and that most were seeking an increase in number of programmes. It is timely to report the increasing pressure on Departmental officers for farm radio programmes. Soon the pressure will be on for T.V. material also. Care will be needed to retain reasonable balance as between these mass contact methods and the group and individual contact methods of extension service.

Head Office Tape Recordings.—Fifty-three recordings of interviews and talks featuring subject-matter specialists stationed at head office were made, for loan to field offices for use in their local programmes. The policy of minimising the volume of head office loan-recordings was maintained, to keep the emphasis on local material, from local stations.

Assistance to Other Organisations.—Assistance in script preparation and in recording of radio interviews for prior release was given to Taxation Department officials before their goodwill visits to forty-three country centres. They report that following the release of such recorded interviews, with which they were similarly assisted in the preceding year, the touring officers secured a record number of contracts (6,320).

Six twenty-five-word announcements were written and recorded for the Certificated Seed Potato Growers' Association, to publicise certified seed potatoes in New South Wales and Queensland. These "commercials" were dubbed on to 12 in. discs (six commercials per disc) for release to radio stations in both States.

For the Minister for Health, the Road Safety Council, the Farmers' and Settlers' Association, the Public Service Board Personnel Section, the University of Sydney, the Department of Primary Industry, and others, the recording facilities of the Division—plus instruction in recorder operation and tape dubbing—were made available on request.

Public Address Equipment.—P.A. equipment was made available and set up on numerous occasions, including the Agricultural Bureau State Congress, the Annual Congress of the New South Wales Commercial Apiarists Association, meetings of Lands Department field officers and of Treasury officers.

Equipment Increases.—Eleven new tape recorders of broadcast quality were acquired; nine for country offices in radio station towns, and one for location respectively at Hawkesbury Agricultural College and the Science Services Laboratory, Rydalmere.

Regional Publicity Officers

There are nine Publicity Officers, one attached to headquarters of each of the nine Agricultural Regions. Their salaries and travelling costs are from the Commonwealth Agricultural Extension Services Grant.

They have continued to function as decentralised officers of Division of Information Services. They have processed matter, or assisted field officers of technical Divisions to prepare it, for press and radio usage, and for agricultural shows; have organised opportunities for the field officers to use radio and the press and farmer meetings; have assisted farmer organisations—in particular the Agricultural Bureau branches—to programme and fulfil extension activities; and, in general, encouraged the interest and developed the skills of field officers in using mass and group media of extension.

Agricultural Bureau—Extension Groups

Provision for Increased Staff.—The Public Service Board and the Treasury provided for an additional Assistant Organiser, to supplement the existing staff of one Organiser and one Assistant Organiser. An acceptable applicant has not been available.

New Bureau Branches.—Sixteen new branches of this farm organisation devoted to extension service were formed in 1959-60. Two branches disbanded.

Affiliation of Branches.—One hundred and forty-two branches were financially affiliated with the State Advisory Council at the 31st May; compared with 131 at that date in 1959 and 119 in 1958. There are many other branches effective in rural adult education, even though they fail to pay affiliation fees to their State Advisory Council.

Divisions represented in the State Advisory Council.—Fifteen of the nineteen geographic Divisions of the Bureau were represented in the State Advisory Council. Divisions not represented were Illawarra, New England, Upper Murray and Central Murray.

The Advisory Council comprised fifteen Divisional Councillors, two women councillors and the president and past president—a total of 19 members. Attendances averaged 86 per cent of membership, for the four meetings.

Divisional Conventions.—Eleven Agricultural Bureau Divisions conducted a convention or field day as an annual occasion of joint effort by a number of branches. Namoi division conducted two conventions, one in the spring and another in the autumn. Seven of the twelve conventions were of two days' duration, compared with four last year. Attendances ranged from 70 to 500.

State Congress.—Approximately 300 delegates and visitors attended during the 35th Annual State Congress at Hawkesbury Agricultural College. The Congress was opened on 14th July, 1959, by His Excellency the High Commissioner for Canada in Australia, Mr. T. W. L. MacDermot. The three-day programme of lectures and demonstrations was well received.

Short-term Schools and Courses in the Agricultural Bureau.—Two *Leadership Schools* were conducted. A five-day school for men at Hawkesbury Agricultural College in July was attended by 23 students, and 23 attended a three-day school organised by the Coonamble branch in May.

A five-day *Pasture and Animal Husbandry School* organised by Lachlan Division and the Mid-Western Agricultural Region at Cowra attracted 40 students; 30 attended the four-day *Irrigation School* organised by Merah North branch at Wee Waa, and 55 attended the four-day *Beef Cattle School* organised by Mitchell Division and the Western Agricultural Region at Bathurst.

Wallabadah branch co-operated with the Graziers' Association to organise a *Shearing School* at Wallabadah.

Dorrigo branch conducted a five-lecture *Course in Animal Physiology and Nutrition* and a six-lecture *Course in Farm Management*. The Farm Management Course was the second on this subject conducted by an Agricultural Bureau branch.

A five-lecture *Course in Soils and Botany* was arranged by Dooralong branch at Wyong. This followed two courses, *one on Soils* and *one on Pastures*, in which the branch has collaborated with Gosford Technical College.

Occasionally branches arranged short schools or courses on a local basis. Running Stream and Korora branches held *courses on first-aid* this year.

In addition, Bureau members supported, and in some cases helped organise, schools conducted by the Department of Agriculture, the University of New South England, and the University of New South Wales.



"Mules-ing" Demonstration at a Sheep and Wool Convention of the Agricultural Bureau
Practice of "mules-ing" for prevention of crutch-strike by the sheep blowfly has increased. Emphasis is placed on it in Sheep and Wool Officers' and veterinary officers' extension service.

Branch Meetings, Field Days, etc.—Agricultural Bureau branches continue to conduct regular monthly meetings for lectures, discussions, film screenings, debates, question nights and other educational activities. Agricultural matter is the subject of most of the meetings, but some are devoted to cultural or general interest topics. A few branches have held an extra series of meetings for discussions, use of "kits" from the University of Sydney Tutorial Board, or documentary films.

Almost every Bureau branch arranged one or more field days. These varied from half-day farm walks or single-subject field afternoons attended by 20-30 people, to types of day that required detailed organisation and attracted up to 200 people.

Tamworth Agricultural Bureau Machinery Field Day continued to attract large attendances for each of two days. Dorrigo and Dorralong branches also staged big machinery field days. Southern Tablelands Division and Muswellbrook branch, respectively, joined with other district bodies for large machinery exhibitions.

Branches undertook a variety of other projects. For example, a sheep show promoted by Burruga branch was attended by 300 people.

Branch tours enabled members to see other industries, areas, or methods, under conditions which encouraged discussion. A number of branches arranged tours. Their visits included Glenfield Veterinary Research Station, Hawkesbury Agricultural College, "Keyline" properties, Port Kembla Steel Works, the M.I.A. and the Snowy Mountains Scheme.

Schools and courses, referred to earlier, were also the outcome of organisation by individual branches.

The standard of local organisation by Bureau branches has been consistently high. Suffice to record, once again, that the voluntary work of Agricultural Bureau members is a major force in dissemination of agricultural knowledge in this State.

Jubilee Year of the Agricultural Bureau.—Branches and Councils are celebrating the Jubilee Year (50 years since formation) in a variety of ways. Some are making membership drives and arranging special educational occasions and show exhibits; others have arranged dinners, balls and picnics; others have taken up community improvement projects such as tree plantings and hall renovations.

Most branches are publicising the Jubilee events to attract new members and to interest new areas. The Jubilee celebrations are increasing members' and other rural peoples' awareness of the Bureau as a State-wide movement. This is destined to be reflected by more new branches and increased membership.

Trials and Demonstrations in the Bureau.—Since foundation, the Agricultural Bureau has co-operated with the Department of Agriculture in field trials and demonstrations by nominating locations and by organising meetings and field days to discuss the results.

The Uniform Pasture Survey and Extension Trials and the Wheat Uniform Fertilizer Trials introduced by the Department in 1959 have received a ready response from Bureau branches. Many are co-operating in them.

Bureau Representation in Other Bodies.—The Agricultural Bureau of N.S.W. has been represented again in the N.S.W. Co-operative Societies Council, the Council of the N.S.W. Bush Nursing Association, the Primary Producers' Council of N.S.W., the State Council of Junior Farmer Clubs and the Milk Zone Dairy Farmers' Advisory Committee.

Agricultural Bureau Scholarship at Hawkesbury Agricultural College.—The Advisory Council continued the Agricultural Bureau Scholarship at Hawkesbury Agricultural College at an annual cost of £170.

Junior Farmer Clubs' State Maize Growing Championship.—The Bureau Advisory Council awarded a five-guinea trophy for this championship.

Beef Cattle Breeders' Competition.—There were 207 entries in the 1959-60 competition—the highest for the eight years of the competition. The State judge said, "The standard of the entries confirmed the improvement in beef herds in the State, and the improvement in several teams judged can be attributed mainly to the competition". Successful field days were held at all but one of the district judging centres. The attendance average was 90 people.

Bureau Acknowledgements of Assistance.—Whilst the Agricultural Bureau is self-governing and some of its activities need little outside assistance, its primary function is to organise and promote rural adult education. In this respect it

relies considerably on other bodies for lecturers, demonstrators, and other assistance in educational programmes. The Bureau has acknowledged gratefully the help, during the past year, of the Department of Agriculture and other State departments, especially the Departments of Conservation and Technical Education, also Commonwealth departments, and the Universities of Sydney, New England, and New South Wales, many commercial firms and the Bush Nursing Association.

Women's Extension Service

Provision for Increased Staff.—The Public Service Board and the Treasury have provided for appointment of a women extension officer to supplement the existing staff of one, the senior extension officer. An acceptable applicant has not been available.

Agricultural Bureau Women.—A major channel for the services to rural women continued to be the Agricultural Bureau of N.S.W.—its State Congress, Divisional Conventions, branch meetings and field days. For most of these functions, sessions of interest to womenfolk were arranged.

Success of the first "Special Conference for Agricultural Bureau Women Members", held at Orange in the previous year, led to a similar conference there again this year. Representatives of 12 Bureau branches met to raise and discuss suggestions for women's activities in Bureau branches.

Three topic "needs" raised by rural women at the 1959 conference have been well catered for at Bureau Divisional Conventions in 1960. Prominent among these was Home Nursing advice. The N.S.W. Bush Nursing Association has consistently made a speaker available. Another topic "need" was Home Management for Better Living. This, too, has been well treated at the Conventions, similarly the topic Other Cultures. For the latter, good use has been made of migrants and also of an officer of the United Kingdom Information Office.

Other Organisations.—Contact with rural women was maintained also through other rural groups including the Country Women's Association, Apiarists Association, Poultry Breeders' Association and Graziers' Association. Work was specifically performed for each of those named organisations in the past year.

Help to Field Officers and Experiment Farms.—By in-person advice and by correspondence, assistance was given to field officers and Experiment Farm Managers in respect of topics or speakers/demonstrators for meetings, field days, conferences, at which women's sessions were desired.

Mass Media.—Some fifty taped recordings were made at head office, of talks or interviews on topics of women's interest. These were on loan to country officers, for use in local radio programmes. Women's interest articles were included in forty-nine of the fifty-two weekly issues of *Press Copy*. Four "Special Circulars to Women Members of the Agricultural Bureau" were issued. These carried suggestions for improved participation by women in Bureau meetings.

Associated Country Women of the World.—The Senior Extension Officer represented the Agricultural Bureau of N.S.W. at Melbourne meetings of the nine Australian societies responsible for organisation of the 10th Triennial Conference of Associated Country Women of the World. The Conference is to be in Melbourne in October, 1962.

Short-term Schools and Courses

Staff Establishment.—A new position approved by the Public Service Board and the Treasury was filled for the first time in December, 1959, viz., "Extension Officer (Organiser of Short-term Schools/Courses)".

The new position has helped liaison between various sections of the Department concerned with programmes for short-term schools or courses, and similarly, liaison between the Department and external bodies—including the Universities of Sydney, of New South Wales, of New England, participating in such schools.

The appointee (Mr. A. D. Mears) has been concerned also with co-ordination of schools and of teaching personnel, relative to dates of forthcoming events, and concerned also with publicity for schools and with enrolments.

In the first seven months of the position, the appointee has been associated with six schools held or to be held at Yanco Experiment Farm and six schools at Hawkesbury Agricultural College, and one at Newport, organised by the Department, two schools at Armidale organised by the University of New England, and one school in Sydney organised by the University of N.S.W.

He has organised the publicity and enrolments for six winter schools at Hawkesbury Agricultural College, and is performing a similar role in respect of four schools to be held at Yanco Experiment Farm early in the spring of 1960. He is also active in programme and handbook preparation for the Yanco schools.

In an earlier section of this Report, under "Agricultural Bureau of N.S.W." there is reference to several other Short-term schools/courses. These have been organised by the Agricultural Bureau staff. This is in accordance with tradition and their close knowledge of the honorary office-bearers and the members of the Bureau.

Under "Extension Service/Methods Training" there is reference to schools, in this category, organised by the Division.

Extension Service Methods Training

Special Schools.—The Division organised, and provided the tutorial staff for the following training schools in extension service/methods:—

(a) Pre-service Training—

- (i) Residential, Extension Service/Methods School (six days) for University of Sydney 2nd year Agriculture students.
- (ii) Residential, Extension Service/Methods School (six days) for University of New England 2nd year Rural Science and 2nd year Agricultural Economics students.
- (iii) Residential, Extension Service/Methods School (five days) for Wagga Agricultural College 1st year students.

(b) In-service Training—

Residential, Extension Service/Methods School (eleven days) for Department of Agriculture Officers (forty-two) and Department of Education Junior Farmer Club Supervisors (two).

Continuing Tutorial Influence on Field Officers.—The Division continued to exercise a day to day training influence on subject-matter officers of other Divisions, e.g., through tutorial advice from the Photographic Aids Section, the Radio Section, the Agricultural Bureau staff, the Editing staff, and the Regional Publicity Officers.

Extension Service/Methods Examinations

Examinations in Extension Methods.—Twenty-three field officers, candidates for promotion from Grade II to Grade III salaries, submitted themselves to the Public Service Board's

Regulation 124 Higher Grades examination paper on "Extension Service" prepared by the Chief of Division of Information Services.

Field Officers' Essays.—Sixty-eight essays, by twenty-nine field officers, variously candidates for promotion above 2nd year rate of Grade I salaries, or promotion from Grade I to Grade II salaries, were examined by the Chief of Division of Information Services. This was in respect of "clarity of quality of expression" as affecting extension service. The essays were treated by the examiner as vehicles for "correspondence teaching", and reports from field officers show that a majority accepted them as such.

Miscellaneous Representation in Various Bodies

The Divisional Chief continued to represent agriculture in two State agencies affecting adult education, viz., the N.S.W. Film Council and the N.S.W. Advisory Board of Adult Education.

The Agricultural Bureau Organiser represented the Bureau in the State Council of Junior Farmer Clubs and the Milk Zone Diary Farmers' Advisory Committee.

The Senior Extension Officer (Women's Service) represented the Bureau in the Council of the N.S.W. Bush Nursing Association, and in the planning body for the 10th Triennial Conference (1962) of the Associated Country Women of the World.

REGIONAL EXTENSION SERVICES

There are nine Agricultural Regions for the purposes of Regional Extension Services, all in the Eastern and Central Divisions. Each Region comprises a number of shires and in terms of property numbers they range from 5,000 to 9,000.

Their purpose has been decentralised administration of the extension and certain of the regulatory activities of the Department of Agriculture, under the immediate supervision of a Regional Supervisor

Personnel in Regions

There are 310 technical officers stationed in country districts for advisory and similar services to primary producers, excluding the staff of the two Agricultural Colleges, the Experiment Farms/Stations, the veterinary officers, and the veterinary officers, and the veterinary inspectors and other officers of Pastures Protection Boards. Some 273 of the 310 officers are in the nine Agricultural Regions.

The accompanying tabulation shows the categories of officers within the Agricultural Regions, under Regional supervision.

FIELD PERSONNEL IN AGRICULTURAL REGIONS, UNDER REGIONAL SUPERVISION

Type of Officer	In Rural Areas	Not in Regions	In Regions									
			Total	South- ern	North Coast	Western	South Coast and Table- lands	South- Western	North- ern	Mid Coast and Hunter	Mid- Western	North Western
Regional Supervisor	9	..	9	1	1	1	1	1	1	1	1	1
Agronomist (Extension)	37	2	35	4	4	4	4	7	4	2	3	3
Agronomist (Research)	3	1	2	..	..	..	..	..	..	2	..	..
Livestock Officer (Sheep & Wool)	18	3	15	2	..	2	2	2	2	..	3	2
Livestock Officer (Pigs)	6	..	6	1	2	1	..	..	1	1	..	..
Livestock Officer (Poultry)	3	1	2	1	..	..	..	..	1	..	..	..
Livestock Officer (Beef Cattle)	2	..	2	..	..	1	..	..	..	..	..	1
Livestock Officer (Apiculture)	3	..	3	1	..	1	..	2	1	..	..	..
Dairy Officer (Extension)	32	1	31	3	12	2	4	2	2	6	..	..
Dairy Officer (Livestock)	1	..	1	1	1	..	..	..	..	..	..	..
Fruit Officer	18	7	11	1	3	1	..	4	1	..	1	..
Entomologist	3	1	2	..	1	1	..	..	..	..	..	..
Pathologist	2	1	1	..	1	..	..	..	..	..	..	..
Publicity Officer	9	..	9	1	1	1	1	1	1	1	1	1
Italian Liaison Officer	1	..	1	..	..	..	..	1	..	..	..	..
Survey Officer (Milking Machines)	4	..	4	..	2	..	1	..	..	1	..	..
Seed Certification Officer	6	..	6	2	..	..	3	..	..	1	..	..
Demonstrator (Farm Machinery)	1	..	1	..	..	..	..	..	1	..	..	..
Fruit Inspector	37	11	26	3	9	3	1	6	2	1	1	..
Herd Organiser	8	1	7	1	3	..	1	..	..	2	..	..
Field Assistant (D.I.E.G.)	7	..	7	1	3	..	1	..	..	2	..	..
Field Assistant (D. of A.)	4	1	3	..	1	..	..	2	..	..	..	..
Field Assistant (A.E.G.)	21	1	20	3	1	4	2	3	3	1	1	2
Herd Recorder	75	6	69	7	24	1	14	4	1	18	..	..
Total	310	37	273	32	69	23	35	33	21	39	11	10

Office Accommodation

There are forty-seven offices in the nine Regions. Office accommodation has been improved considerably. In two instances accommodation is unsatisfactory, and in each of those cases the position is in hand; new accommodation is being negotiated. Some of the recent developments are summarised as follow:—

Gunnedah.—Originally, office accommodation at Gunnedah—headquarters of the North Western Region—comprised a single room. After the North Western Region was established, in December, 1958, arrangements were made with the Liverpool Plains Shire Council to take over the Council's former offices. Now, the Regional headquarters at Gunnedah comprise a suite of five offices, all recently painted and glass partitioned.

Dubbo.—Division of Animal Industry establishment of a new District Veterinary Officer position at Dubbo has been collated with the need for better accommodation of extension staff at that centre. Good, spacious accommodation has now been obtained for all Department of Agriculture staff there by occupying a complete floor of another building.

Cootamundra.—Cootamundra is one of the two earlier-mentioned places where accommodation is still unsatisfactory. The office, in a room at the Court House, has to be vacated on some Court days. Four persons and their records normally occupy the space. Alternative accommodation has been difficult to secure in Cootamundra, but negotiations are in hand, and transfer of a temporary school building may be the answer.

Deniliquin.—For many years the Department of Agriculture has occupied a room in the C.S.I.R.O. building at Deniliquin. In recent times the Water Conservation and Irrigation Commission vacated a suite of offices, and the Department has acquired accommodation in them. To show the need, it is of interest that whereas in 1949 the Deniliquin staff comprised one extension officer, today it comprises four extension officers, one field assistant, and one office assistant.

The Agricultural Bureau as Affected by Regional Services

Association between the Agricultural Bureau, a voluntary movement in extension service, Regional Supervisors, and district officers in the regions, has become closer each year.

In addition to arranging short-term schools with the geographic divisions or the branches of the Agricultural Bureau, regional officers have actively assisted Bureau branches to formulate subject-matter for their annual programmes of monthly meetings and to organise speakers, demonstrations and other aids. Many demonstrations have been arranged and conducted, on crops, pastures and stock, with Agricultural Bureau branches. Each demonstration has given opportunities for small, informal or formal field days; many such have been held.

Some of the Agricultural Bureau developments through association with the Regional staff have been as follow:—

Southern Region.—For some years past the Agricultural Bureau movement has not been active in the Southern Region. In the past year, as a result of a drive by the Regional staff and officers of the Division of Information Services, old branches have been re-activated, new branches have been formed, and a number of successful field days and film evenings have been held.

North-Western Region.—In the North-Western Region, only established in December, 1958, there has been great interest in the Agricultural Bureau. Today, 28 Bureau branches are active within the region. In the past year most of them conducted field days or special day meetings in co-operation with the Department's officers.

North Coast Region.—In no part of the State has the Agricultural Bureau developed—following establishment of a region—as notably as in the far northern section of the North Coast region. Tribute has been paid in this respect to the Regional Publicity Officer for his keen interest in and assistance to the Agricultural Bureau movement. When the region was established in 1952 there were six active Agricultural Bureau branches in it. Now there are 28 branches. Three of them were inaugurated in the past year.

Conferences, Field Days and Conventions

Each year, conventions, short-term schools and courses, of two to three days duration, are proving more popular with the farming community. Each school or course is arranged

in co-operation with a local organisation, such as the Agricultural Bureau, Graziers' Association, Primary Producers' Union, etc. The favoured type of school is that which deals with one feature of agriculture only, as "dairying", "beef cattle", "pastures", "irrigation", "farm management", etc. Each region has held one or more such school or course in the past year.

Some of the "group extension" activities are mentioned in following paragraphs.

Conference of Regional Supervisors.—A conference of Regional Supervisors is held biennially at Head Office. Such a conference was held from 11th to 14th August, 1959. Senior personnel of the Department gave short addresses and entered into discussion with the Regional Supervisors. Senior officers of the Public Service Board and Government Stores Department did so also.

Southern Region.—Commercial and industrial interests affecting agriculture have co-operated splendidly in the conduct of large-scale field days. At a "silage" field day at Tumut, conducted in association with local machinery firms, 150 persons attended—a big attendance for a comparatively small centre as Tumut. Successful "Irrigation" field days were held at Wagga and Tarcutta, in conjunction with firms handling irrigation equipment.

The Region's first "Pasture and Animal Husbandry" School conducted away from Wagga Agricultural College drew an attendance of 44 farmers. It extended over three days. Participants recommended that further such schools be conducted.

South Western Region.—A major field day was held at Barham in March, 1960, approximately 500 persons attending. This was a remarkable attendance, in that the field day dealt with cotton growing. Until the last couple of years cotton has been of very minor interest in irrigation areas along the Murray River.

Mid-Western Region.—During the year a "Pasture and Animal Husbandry" School, over three days, was held at Cowra. Forty farm people attended. Of this number, 20 were in residence. A Cowra motel was engaged to accommodate them.

There were 70 field days in this region during the year, for a total attendance of 3,560 farmers. In addition, 40 farmers' meetings were arranged, and these had an attendance of 1,130 persons.

North-Western Region.—A total attendance of 2,593 primary producers rewarded the organisation of 30 field days during the past year. One field day held at Walgett, on the far Western Division boundary, drew 150 persons. Most of them travelled big mileages to get there.

North Coast Region.—To bring to the notice of those concerned or interested, facts about the more important economic weeds and the recommended methods for their control, a "Weeds Refresher Course" was arranged by Regional officers in conjunction with the Richmond River (Weeds) County Council. It was a two-days course. Weeds officers and inspectors from almost every shire and municipality in the Region were in the attendance.

Western Region.—The Orange Machinery Field Day, in future to be known as the Orange National Field Day, is an annual in this region. It is a three-days function. There was an attendance of 36,000 people in 1959. Regional staff conducted an Information Centre there and, each day, films were shown and talks were given by officers.

Northern Region.—Many commercial firms in the Northern Region have asked for joint participation in field days, in appreciation of the impact on farm people. Fertilizer firms have been specially interested in pasture field days and the use of sulphur. Stock and Station Agents organised a field day on pigs; a firm at Walcha co-operated in organisation of a field day to show bloat control in stock, and displays of poultry equipment by firms have been a feature of poultry field days.

South Coast and Tablelands Region.—A "Weeds Refresher Course", a two-day course, was held at Goulburn. It was the first of its kind in this region. Fifty-one representatives of local-government bodies and semi-government organisations were in the attendance, and commended the value of the course.

A "Dairy Farmers' Refresher Course", a three-day course, was held at Bega. It was conducted co-operatively with the Bega District Association For Advanced Farming. Sixty-seven applications were received for the course, and at no session was the attendance less than 40 persons.

Regional Publicity—Press and Radio

The Publicity Officer position in each of the nine regions continued to be a big factor in getting agricultural information to the attention and interest of primary producers—through the press and over the air.

Southern Region.—Some 391 publicity statements were processed and issued during the year, to 30 newspapers and three radio stations operating in this region. An interesting and popular development has been the introduction of a regular weekly "Question Box" column on agricultural matters, in several of the newspapers. All officers participated in answering the questions. Newspaper editors have insisted that the innovation be a regular weekly feature.

From Radio Station 2WG, Wagga, because it has an audience in the West Wyalong district in the Mid-Western Region, a weekly 15-minutes session using material suitable for the West Wyalong and adjacent areas is now broadcast. Both Southern Region and Mid-Western Region contribute. This is additional to the Southern Region material from all three stations.

Mid-Western Region.—There were 692 separate radio broadcast sessions, over two stations in the region and the two which are outside it but popular in the region. This is an increase of 226 broadcasts over the number made in the previous year.

A feature of radio broadcasting in the Mid-Western Region was that every officer contributed regularly to the 85 hours broadcast time involved. Tribute has been paid to the Parkes district agronomist. He was personally responsible for the preparation, delivery or recorded delivery of 28 hours of actuality broadcasts.

Mid-Coast and Hunter Region.—An innovation in this region was promotion of a "Film and Discussion Evening" in the Conference Room at the Regional headquarters, Maitland. The theme selected was vegetable production, and 60 vegetable growers attended. This initial success has encouraged extension officers at Maitland to promote regular discussion groups.

North Western Region.—Until the Region was established in December, 1958, there was very little agricultural publicity over radio stations at Gunnedah and Moree. In the interim, regular broadcasts have been established at both stations. Radio time for farm sessions in the past year amounted to 51 hours. Testing their effect, on many sessions the availability of Department of Agriculture leaflets was featured. As a result, 5,000 publications were requested and issued.

North Coast Region.—Press publicity in this Region is on the firm basis that would be expected since it has been in operation for eight years. The requirements of newspaper editors are well known, and as a result most of the publicity releases are used, in the dailies especially, at Lismore and Grafton, in special agricultural sections.

The editors of newspapers in those cities have also assisted by processing photographic material supplied by Regional officers for use with topical articles.

Most of the newspapers have freely given space, in newspaper form, for what have been in effect advertisements for field days, conventions, Agricultural Bureau meetings, etc., arranged by officers.

In the radio field, 1,002 talks (including replicated use) by officers have been broadcast. This was over the 3 national and 2 commercial radio stations in the Region. In addition, the stations have extracted much material from publicity statements—for general agricultural announcements.

Western Region.—Officers of the Western Region have become well known to primary producers through their radio broadcasts. During the year, 730 broadcasts were made. Many of them were in regular, sponsored sessions over the five commercial radio stations in the Region. In addition to the officers' broadcasts, considerable material of Regional origin was in the news sessions, the special A.B.C. broadcasts, and the "Angle on the News" sessions conducted by local stations.

Regional Advisory Committees

The respective Regional Supervisor is Chairman of a committee established for the Region by the Minister for Agriculture to advise on agricultural matters, in particular, matters pertaining to the Region.

The nine Advisory Committees have each met regularly, at quarterly intervals, in the past year. Their minutes have been appropriately distributed in the Department, and have been a valid and important contribution to the two-way traffic essential to healthy extension service.

AGRICULTURAL EXTENSION GRANT

The Commonwealth Extension Services Grant to the States was first made in 1952. It was due to terminate on 30th June, 1960, but the Commonwealth has determined to continue it until 30th June, 1965. The total allocation to the States is £300,000 per annum. New South Wales receives £75,000.

Conditions of the Grant

A conference of representatives of the Commonwealth Department of Primary Industry and State Departments of Agriculture was held at Canberra in April, 1960. This was to discuss means of using the funds.

The Commonwealth, when the grant was made originally in 1952, had placed emphasis on increased production of commodities for which production goals had been set by the Australian Agricultural Council or for which there was an overseas market. The funds were not to be used on projects relating primarily to wool and dairy production. Funds for these had been made available from other Commonwealth sources.

The conference in April, 1960, agreed that the original objective remained desirable, but that increased emphasis in Agricultural Extension Grant projects should be given to the economic aspects of production and marketing. This view was agreed to by a subsequent meeting of the Australian Agricultural Council.

Agricultural Extension Grant Projects

Broadly, the range of projects in New South Wales has been concerned with demonstrations with crops, pastures, livestock, horticulture, and agricultural machinery; provision of extension-aids equipment, as cameras, tape recorders, cine and "still" film projectors, public address systems, microphones and other supplementaries, to extension officers; appointment of staff to assist technical officers in the field; appointment of publicity officers, and editing assistants; production of publications; preparation of material for press and radio; payment of fees and expenses of agricultural trainees and cadets at universities and colleges; and visits by officers to other States and overseas for attendance at technical conferences or to gain knowledge likely to benefit their extension duties.

Since 1952, some 80 different projects have been financed with Agricultural Extension Grant Funds. Some of these projects, as, for example, one concerned with pastures in wheat districts, have had as many as 300 individual demonstrations on farmers' properties.

A recent, new project is that concerned with water and soil testing. There is further reference to this, in a later paragraph.

Another new project, to commence during 1960, provides funds and expenses for appointment of two Farm Machinery Officers, to be stationed respectively at headquarters of the South Western Region and the Western Region.

In the past twelve months the Department has appointed an Agricultural Engineer; so, establishment of the two extension positions in the field may mark another phase in development of the advisory services of the Department.

Pasture Projects.—Some 1,500 pasture demonstrations, varying in area from 5 to 50 acres, have been conducted on farmers' properties. They have demonstrated recommended pasture mixtures, sowing methods, pasture management, and fodder conservation, and have been definite aids as sites for field days.

Livestock Projects.—Livestock demonstrations have been conducted with beef cattle, pigs, and poultry. Although no actual demonstrations with fat lambs have been financed from the Grant, many of the demonstrations concerned with pastures have had fat lamb production as a prominent side issue.

"Beef Cattle—Improvement of Breeding Stock".—The usual practice in selecting beef breeding cattle has been to select replacement stock on conformation, grade, and type. Demonstrations concerned with selection on other important production factors were commenced at Bombala in 1956. Later, another demonstration was established in Orange district. Others have been planned for Gunnedah district.

In these demonstrations, portable cattle-weighing scales are applied, and calves are weighed at regular intervals, based on the fact that a beef cow displays her worth or otherwise in the calf at foot—its weight, condition, and conformation. The project has demonstrated to farmers that there is often more than 100 per cent. difference between weights of calves within the one herd.

Results in the demonstrations have shown farmers the great value of selecting cows of beef breeds on the basis of their ability to produce calves of a good standard and weight, with due regard for conformation and other factors of the breeder. These demonstrations have created considerable interest in the beef cattle world. In addition to field days on the properties where the demonstrations are sited, there has been a big demand for addresses at conventions of graziers and farmers. Results have been quoted in a chapter written for the book *"Beef Cattle in Australia"*. The veterinary officer supervising the demonstrations has also given a talk on them at a science conference in Melbourne.

"Poultry Production Improvement Plan (Eggs)".—This is a long-range scheme to increase egg production per bird. It is based on breeding for egg production, by using proven high-production stock. Eleven private breeders have been provided with additional equipment, enabling them to segregate the many groups which are part of the plan. The breeders contracted to comply with certain conditions, and to make progeny available for testing.

Results have been most encouraging. Increases by some strains of hens, as the result of selective breeding, have been as high as 20 large hen-eggs per annum.

Indicative of the participant breeders' high regard for what this Agricultural Extension Grant project has demonstrated, six of them have engaged qualified personnel to direct or carry out their breeding work.

This long-range project is not aimed at increased production so much as at reduced cost of production per egg.

"Black Spot Control on Pome Fruits".—This project was to demonstrate the eradication method developed in recent years by the New South Wales Department of Agriculture, for black spot control in pome fruits. All apple and pear trees on 170 acres of orchards and home gardens in the Yetholme area of the Bathurst district were involved in the demonstration.

The project has shown that the eradication method of black spot control recommended by the N.S.W. Department of Agriculture is effective. Conditional comments are included earlier in this Report, under "Biology Branch, Division of Science Services."

"Water and Soil Testing Units".—An officer of the Chemistry Branch of the N.S.W. Department of Agriculture devised an assembly of electronic equipment and chemical apparatus capable of carrying out many and varied tests with water and soil. There has been reference to this in the Report of the Department for the past two years; in particular under "Chemistry Branch, Division of Science Services".

A trial with a prototype unit at a Regional headquarters showed its value as an extension aid in agricultural advisory services. Funds from the grant have enabled a unit to be placed at each of the nine Regional headquarters.

Although not placed in the Regions until early in 1960, already some 500 tests have been done with the units, mainly in respect of water salinity levels as affecting irrigation or livestock. Outstanding value of this on-the-spot testing of water has been demonstrated in irrigation areas, and in small private irrigation projects using streams, bores, wells and dams.

All extension officers are able to operate the water and soil testing equipment. Press and radio have given space and time to publicity for this decentralised extension service. Talks and demonstrations have been given to farmers' organisations, dairy technology associations, veterinary associations, and the personnel of the dairy factory co-operative societies. Already, three private organisations have ordered water and soil testing kits, costing about £150 each.

Employment of Field Assistants.—Twenty field assistants are employed under the Agricultural Extension Grant. Each is supplied with motor transport; a panel van or light utility

truck. A field assistant is located at each of the Department's bigger agricultural establishments in the country districts. Broadly, they assist extension officers in any way likely to relieve the latter of routine; arranging field demonstrations; sowing, maintaining and harvesting field trials; "roguing" pure seed cereal areas; assisting the farmer in production of hybrid maize seed; certification of pasture seed; operation of extension aid equipment; collection of specimens and samples; and arranging field days.

"Publicity Officers".—The effect of this major project, providing the salary and expenses of a Publicity Officer for each of the nine Agricultural Regions, as an officer of the Division of Information Services, is apparent from earlier sections of this Report. (See under "Regional Extension Services" and under "Division of Information Services").

"Agricultural Trainees and Cadets".—A sum of £8,000 is allocated from the Agricultural Extension Grant (and £4,000 from the Dairy Industry Extension Grant) to pay the fees and expenses of agricultural trainees and cadets at universities and agricultural colleges.

During the past year, twenty-seven students, whose fees and expenses were paid from grant funds, attended either Sydney University, New England University, Hawkesbury Agricultural College, or Wagga Agricultural College. Thirteen are doing the Veterinary Science course, five are in Agricultural Science, two in Rural Science, five attend Wagga Agricultural College and two are at Hawkesbury Agricultural College.

Already twenty-five such trainees or cadets have graduated, and most of them have been taken into the N.S.W. Department of Agriculture. Each year, the number of them completing a university degree or agricultural college diploma course is about eight.

Publication of Books and Pamphlets.—A former Principal Agronomist (Pastures) of the Division of Plant Industry was re-employed (on retirement in 1953) as Editorial Assistant in the Division of Information Services; to produce "Weeds" and "Pastures" volumes in a Farmer Handbook series. The first volume, "Weeds", was completed in 1958 and finally made available for sale in 1960. The details of its favourable reception are apparent earlier in this Report (see under "Division of Information Services").

An Editorial Assistant was also employed under the grant to assist district agronomists to produce a booklet on pastures for the respective district. Some twenty-five such booklets have been printed. They are well illustrated productions, each in the vicinity of sixty pages.

Twenty-four single pages pamphlets in full colour, on insect pest life-cycles and control measures have been produced; fourteen are in distribution and ten are in proof stages with the printer. The art-work for a further eight such colour-plate pamphlets is proceeding. It is the work of Mr. E. H. Zeck, former entomologist (retired) in the N.S.W. Department of Agriculture.

DAIRY INDUSTRY EXTENSION GRANT

The Commonwealth Dairy Industry Extension Grant was first made in 1948. It will continue to 1963. The allocation to New South Wales is £64,880 per annum.

Principal condition of the grant is that it shall be used towards improved practices in the dairying industry, through allocations of funds to extension service projects.

Products have included demonstrations on pastures and fodder conservation; surveys into milking efficiency; surveys into sterility in dairy cattle; recording of production of dairy cows; field assistance in dairy advisory work; supply of extension-aids equipment; and appointment of trainees and cadets to universities and agricultural colleges.

Some of the principal projects are mentioned:—

Pastures and Fodder Conservation Projects.—Since 1948 the number of demonstrations concerned in the main with pastures, fodder crops, and fodder conservation, on farmers' properties, has been 1,078. Pasture demonstrations have been conducted as a general practice, for a period of two years. Thereafter, the co-operating farmer has been expected to maintain the sown pasture at his own expense; 152 pasture demonstrations terminated last year, and 120 new demonstrations were commenced.

On the far north coast, where pasture improvement presents special problems, many of the demonstrations have been aimed at a complete "feed year" for milking cows. Pastures had to be sown and maintained in good condition, fodder crops grown, and a certain amount of fodder conservation practised.

Results have shown that a "feed year" programme is practicable. Many farmers have adopted practices featured in this type of "feed year" or fodder programme project.

In Maitland area, there has been outstanding development in respect of fodder conservation, as an outcome of the Grant projects. There have been fourteen silage demonstrations in this area in the past two years. Their success has stimulated conservation of record quantities of silage by farmers in Maitland district.

"Water Cooling Towers for Dairies" Project.—Initially, successful demonstrations were conducted in dairies in Deniliquin district, of the "tower" method of cooling water. Comments by cream graders at factories were that cooling of the cream, particularly in summer, had improved cream quality and factory managers recommended to dairy farmers that such towers be installed.

Similar results are now being obtained in the Taree district, where cooled water is being used in the dairies to keep both cream and milk at a low temperature.

"Milking Machine Survey" Project.—Four years ago, officers were appointed to survey the efficiency of milking machines. Results of the survey were surprising. In consequence, there are now four Milking Machine Survey Officers, one each at Lismore, Parramatta, Taree and Coff's Harbour. A further appointment will be made at Wagga.

There is further information on the success of and developments from the Milking Machine Survey project, in this Report, under "Division of Dairying".

"Herd Recording" Project.—During the year, seventy-six herd recorders were employed. They recorded the production of approximately 56,000 cows in the "Group Section" of the Herd Production Improvement Scheme, and approximately 8,000 cows in the "Official Section" of the Scheme; a total of 64,000 cows.

Twelve new herd recording units became operative this year, comprising some 240 members and 8,000 cows. This increase came after a static period of some years and the renewed interest may be indicative of the influence of the Grant expenditures.

Establishment of five more units has been approved. Consideration is being given also to establishment of five recording units to cover specifically the areas served by the N.S.W. Milk Board's Artificial Breeding Centre at Berry. This would enable bull-proving, of bulls used in artificial breeding.

"Extension-Aids Equipment" Project.—Various items of extension-aids equipment, as under the Agricultural Extension Grant, have been supplied to extension officers in dairying districts.

Field Assistant Project.—The seven organising officers employed under the Dairy Industry Extension Grant continued to give valuable assistance to extension officers generally, and to dairy officers in particular, in the arrangement of field demonstrations, in the organisation of field days and meetings, and in relieving extension officers in dairying districts of some of their routine.

It has been determined during the year that the title "organiser" would be changed to "field assistant", since their duties were similar to those of field assistants under the A.E.G.

It is of interest to record that amongst the seven D.I.E.G. field assistants there are two agricultural college diplomates and one man who is studying at the University of New England.

Publication "Dairy Topics".—The printed booklet *Dairy Topics* containing articles of particular interest to dairy farmers has been published bi-monthly; 18,100 copies of each issue, posted direct to dairy farmers.

Amongst the articles featured in the past year were eighteen stories of achievements by dairy farmers, reports on surveys of milking machine efficiency, comment on group herd-recording results, pertinent comment on diseases affecting dairy cattle, accounts of pasture, crop, and fodder conservation demonstrations conducted under the Dairy Industry Extension Grant, publicity for water cooling towers as an aid to improved cream quality, recommendations for control of hoven or bloat when grazing on sappy pastures, and many other articles for dairy farmers' interest.

HAWKESBURY AGRICULTURAL COLLEGE

Student Enrolment Analyses.—Following are statistics of student enrolment for the various diploma courses from 1950 to 1960:—

Course	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
Agriculture	161	164	168	196	190	200	198	182	187	187	190
Horticulture	6	6	6	..	..	..	..	..	..	..	..
Dairy Technology	17	13	14	17	16	15	24	34	33	33	32
Food Technology	..	7	13	11	10	9	12	17	16	17	15
Totals	184	190	201	224	216	224	234	233	236	237	237

Total enrolment is limited by the accommodation available; thus enrolment in each course tends to be at a certain level.

The overall enrolment, 237 in 1960, was the same as the record figure in 1959. Enrolment for Agriculture was 190, three more than in 1959, made possible by a total of three less in the two Technology courses.

The number (fourteen) admitted to 1st Year of the Dairy Technology Course is appreciably less than the present upper limit (twenty) for this course. Of the fourteen enrolled, eight were admitted under the Dairy Industry Apprenticeship Scholarship Scheme, making, as in 1959, a total of seventeen at present pursuing the Dairy Technology Course under this Scheme.

The number (seven) enrolled for 1st Year of the Food Technology Course is disappointing, being five less than the upper limit (twelve) for any one year of this Course. The total enrolment in the Food Technology Course now stands at fifteen, two less than in 1959. Of the fifteen students enrolled, six have been sponsored by food processing companies.

Admissions into the Dairy Technology Course this year included one each from Queensland, Tasmania and Western Australia.

At present, of 190 students enrolled in the Agriculture Diploma Course, sixty are the sons of farmers.

The educational standard of entrants this year was as follows:—

Standard	Agric. I		Dairy Tech. I		Food Tech. I	
	No.	%	No.	%	No.	%
Leaving Certificate (5 years High School)	41	55	4	29	6	86
4th Year High School	14	19	2	14	..	..
Intermediate Certificate (3 years High School)	19	26	8	57	1	14
Total	74	100	14	100	7	100

The figures show the same trend and pattern as in 1959. The relatively low percentage of students with the Intermediate Certificate standard, the minimum for entry, is a little less than in 1959—in all courses.

Diploma Examinations.—Seventy-one students succeeded in the Diploma examinations, fifty-two in Agriculture, thirteen in Dairy Technology and six in Food Technology.

Three of the Diplomas awarded in Agriculture were of Honours Class I standard. Honours were also gained by two students in Dairy Technology, one being Class I, while two students obtained Honours Class I in Food Technology.



"College Pride"—New French Bean from Hawkesbury College

Hawkesbury Agricultural College agronomists' Breeding Line No. 26, a selection from Hawkesbury Wonder x Granda, was released last year as a new variety—"College Pride". In this its first year in commercial areas it has consistency outyielded the until-now leading commercial varieties.

Students' Tours and Visits.—The annual instructional tours and special visits to places of interest were conducted as usual.

Employment of Diplomates in Agriculture.—Of the fifty-two former students in Agriculture who gained Diplomas at the 1959 examinations, twenty-three have gone to farming and grazing properties, fourteen have gone to Government Departments or Agencies, including nine to the State Department of Agriculture, eight are with private firms as technical representatives and three in other capacities with firms associated with agricultural products, two have enrolled as University students, and two are overseas. Two who failed to obtain the Diploma are engaged with private agricultural firms.

Agricultural Diploma Course Modified.—Minor internal changes have been made, comprising rearrangement of matter in the Agriculture course. Broader issues arose during the investigations. These involve policy, and are at present under attention at higher levels.

Students' Report Writing.—"Technical Reports" has been introduced as a new subject for final year students in all three courses. Students are required to write reports following major tours. In addition, they must present a thesis on a subject of their own choice.

The innovation aims to give students experience in orderly recording of observations, facts and impressions, and in abstracting and condensing matter from references. English as a subject is not taught at the College, but introduction of "Technical Reports" should help to improve clarity and quality of expression.

Woolclassing Certificates.—College students again maintained a high standard in the Final Certificate examinations in Woolclassing, conducted by Sydney Technical College.

"Commencement of Year" Services.—This year, on the first Sunday, special "Commencement of Year" Services were held at the College. Advantage was taken by local clergymen, to acquaint new students with details of the local services and fellowships. Regular visits by the clergy are also being made.

Colombo Plan Students.—It has been policy not to accept Colombo Plan students, only because it was not possible to accommodate them. The situation has been re-appraised and it has been decided to admit one Colombo Plan student each year into the Dairy Technology course.

Extra-curricular Activities of the Students.—Student activities were well conducted. The Students' Representative Council, the Sports Club, the Debating Society, the Camera Club, the Student Christian Movement and the College branch of the Agricultural Bureau contributed to the promotion of the social life and welfare of the College. The Inter-year Debating Shield was won by Agriculture III. The Australian Agricultural Colleges Inter-Collegiate Tennis Shield was won by Hawkesbury.

Olympic Pool Project.—The Olympic Pool, to which friends, parents and Old Boys contributed so generously, is now nearing completion. Bulk of the manual work has been done by students.

Twenty-seven students enrolled in a Life Saving Club. Results of the examination for awards are not yet to hand.

Schools for Farmers.—Short Course Schools for farmers were conducted in Dairy Farming, Poultry Farming Pig Raising and Tractor Maintenance. In all, some 145 farmers attended these schools. The schools were of four to five days duration.

Schools were also provided for Junior Farmers in Pig Raising, and in Dairy Farming, with an attendance of forty-four.

School for Canning Factory Foremen.—A canning technology school for factory foremen was held in 1959 at the college, the first school of this nature in Australia. It was attended by nineteen men, from five States. Great interest was roused in the food processing industry. A similar school in 1960 has been attended by forty-four men, from all States.

School for Dairy Factory Apprentices.—This was held as required under the Dairy Industry Apprenticeship Scheme. It was attended by thirty-one apprentices.

Youth Leadership School.—This was promoted, organised and staffed by the Agricultural Bureau section of the Department, and attended by twenty-two young men from farms. It was of five days duration.

Summer School in Apiculture.—This was again held in January, with an attendance of sixteen.

University Students' Courses.—The College provided practical demonstrations in farm management and machinery, for students in the second year of the Sydney University Agricultural Science Course.

Conferences, Field Days, etc.—Facilities of the College were made available for residential conferences of Departmental Farm Managers, the Biennial Conference of the Society of Dairy Technology, the State Congress of the Agricultural Bureau of New South Wales, the Annual Poultry Field Day, and vegetable farmers' and seed merchants' inspections of trials and the results of research work on vegetables.

Staff Training.—Staff training has comprised discussions and demonstrations on various aspects of lecturing and demonstrating. Some of the sessions have been led by outside guest speakers, and some by senior members of the College staff.

People responsible for training programmes in large public companies have addressed the staff. Lecturers and senior officers in charge of sections have been encouraged to spend at least one week per year away from the College on approved work. Junior members of the staff have been given the opportunity to acquire experience off the College, and to work for a time in other appropriate College sections.

Arrangements to hold a special Refresher School for lecturers and instructors are on hand, to review not only methods of teaching, but also recent advances in the various subjects taught.

Principal's Visit to New Guinea.—The Principal officially visited Papua and New Guinea for three weeks in September, 1959; to discuss, with the Administration, problems relating to agricultural training, and as guest speaker at a conference of Agricultural Extension Officers of Papua and New Guinea.

Many College diplomats proceed to positions in New Guinea, and the Principal now has a good idea of their prospects and type of work. They have played a considerable part in the development of New Guinea, in Government service and on private plantations.

The College in Relation to Sydney Royal Show.—The College appreciated the action of the Council of the Royal Agricultural Society in permitting practical demonstrations to students at the R.A.S. Show. Students also competed in the judging competitions, and a large number served as "cattle attendants". Similarly they served as "assistants" at the Sheep Show.

College entries were made in the Arab Horse and the Friesian Cattle classes.

The seventeen Friesian cattle exhibited by the College at the R.A.S. Show, 1960, obtained twenty awards; and the College was the second-most successful exhibitor in this breed. The Friesian awards gained included Reserve Senior Champion Bull with "Hawkesbury Prince Regent"; also Junior Champion Bull, and eight firsts and three seconds.

In the Arab Section, the mare "Thalia" was awarded 1st in the Arab "Mare Four Years and Over"; the mare "Caliope" was awarded second in "Mare Two Years and Under Four Years", and was also Reserve Champion. Three other awards were obtained.

In the Cheese Section, first prize was obtained for Blue Vein Cheese, third prize for Cheese other than Cheddar; and three other prizes, one second and two thirds. The College was awarded the prize for the Most Successful Cheese Exhibitor.

Hawkesbury District Agricultural Association's Show.—Entries of stock included Arab horses, Poll Hereford cattle, vealers and beef bobbies in the commercial beef class, and a team of twenty-two Friesians. Awards received for Friesians included that for the Most Successful Exhibitor, seven firsts, seven seconds and six thirds. The College gained the Most Successful Exhibitor Award in beef cattle, with seven firsts and three seconds.

The Arabs were awarded first and second in the Arab or Part Arab Stallion class; and first and second in the Arab or Part Arab Gelding or Mare.

Works and Improvements at Hawkesbury

Modernising, renovation and re-equipment of all the older buildings is proceeding.

Student Accommodation.—Valder Block has been renovated, equipped with new furniture and floor covering, and painted inside. Thompson Block is undergoing the same treatment. Potts Block and the staff accommodation have been scheduled for similar treatment. Thus, all older buildings and equipment will have been fitted for modern usage.

Stewards' Quarters.—These have been refurbished and painted inside.

Main Kitchen.—Major re-design, renovations and re-equipment of the College kitchen are nearing completion. New refrigerator rooms have been built; so located as to make the organisation of work more efficient.

Cattle Section.—New beef cattle yards were completed. A hillside dam of 16,000,000 gallons capacity was constructed. A hayshed has been moved into the Cattle Section from the Clarendon paddocks area. A set of scales for test-weighing cattle has been installed.

On the Dairy Cattle Section, fencing subdivision and realignment have been completed.

Agronomy Section.—A small glasshouse has been provided to enable weed control trials during the winter period.

Students' Garage.—One section of a garage for final year students' cars has been completed. Provision has been made for a repair room for students' use. Student owners of vehicles will contribute labour to complete this room.

School of Dairy Technology.—A worn-out wooden churn has been replaced by a new 40-box stainless steel butter churn. A "Perga M" Milk Cartoning machine donated by Hygienic Containers Pty. Ltd. in February, 1960, has enabled student training in processing and cartoning homogenised and flavoured milk. District sales of this milk are now about 3,000 cartons per week.

School of Food Technology.—"On loan" expensive items of equipment were accepted. They included an automatic can-closing machine, an I.C. Filler, a Steam Blancher, and a Chemical Re-agent Feeder. These have been valuable aids in student training.

Poultry Section.—A machinery shed has been constructed. A poultry house was erected in the orchard for the "Poultry in Orchard" demonstration.

Bacon Factory.—Renovations to the bacon factory have been almost completed, to fit it to process pig and beef products, as practical work in the Food Technology course.

Safety Guards.—Building of safety guards around dangerous machinery continued.

Olympic Pool.—Tiling of the Olympic Pool and small pool for children has been almost completed. The chlorination plant is almost complete. Foundations have been prepared for two dressing sheds.

Sectional Operations at Hawkesbury

The various farm sections continued their normal work of production, instruction, demonstration and research.

COLLEGE FARM

Cereal Areas.—Sowing conditions were adverse. Only 300 acres were sown, a reduction of 25 per cent on the previous year. Continuous rain at harvest period prevented most areas being harvested for hay. Thus, only twenty-five tons of baled oaten hay were added to fodder reserves; whereas 130 tons of cereal hay were utilised for stock feed, reducing the reserve to 300 tons. An area of sixty acres was cut for 150 tons of silage. Odd areas were stripped for grain, for an average of one and a half bags of oats and one bag of wheat per acre. Rust and rotting of straw drastically reduced grain yield.

Oaten Grain.—One hundred tons of feed oats were used, compared to 36.2 tons during 1958-59 when supplies were limited and feed was rationed. Of the 100 tons, 42.86 tons were transferred from other Farms and 57.14 tons were purchased.

Wheat Grain.—Wheat transferred from other Farms was 43 tons. It was used at the poultry and piggery sections.

Silage Production.—Besides 150 tons of cereal silage, 80 tons of millet and 100 tons maize were placed in the overhead silos and 100 tons of saccaline was stored in a stack silo for winter feed for beef cattle. Some 300 tons of silage are stored at present.

A total of 405 acres of cereals has been established in the autumn of 1960, and the harvest potential is favourable.

An area of 40 acres, previously bulldozed, was cleaned up, burnt, and sown to cereal for the first time. Further clearing of land is necessary, to allow a wider rotation, and to maintain present production and fertility.

Lucerne Hay.—Some 63.2 tons of lucerne and pasture hay were produced, 20 tons more than in the preceding year. Hay transferred from other Farms totalled 35 tons. Of this amount, 10 tons were milled into lucerne dust for the poultry section and 25 tons were used at the dairy. Approximately 30 tons are stored at present.

Summer Crops.—An area of twelve acres was sown to millet, and, after light grazing, the surplus feed was made into silage. *Sorghum almum* was established on twenty-two acres of an area where soil fertility is moderately good, and a satisfactory crop was grown. The 7 in. rows gave best control of grass and weed growth. This perennial could be a valuable fodder plant in years of high summer rainfall.

Dry Area Pastures.—This autumn sixty-five acres were sown. An area of 250 acres of sown pastures has contributed to a higher plane of nutrition for stock.

Irrigated Pastures.—High summer feed production was obtained from irrigated pastures, but the autumn and winter pasture feed has been limited. In the 1959 autumn another forty acres of pasture was established, spray irrigated from the turkey nest dam.

Water Storage.—The Hillside dam with capacity of sixteen million gallons was completed by contract. A storage rate of 4.5 yds. of water to 1 yd. of earth moved was obtained. A further area of forty acres for irrigation is now being prepared; and a further area of twenty acres is being cleared. A 3,000 ft. drain with a maximum depth of 8 ft. to divert water to the dam, was constructed with College equipment.

College River Farm.—Production included silage 200 tons, maize grain 1,260 bushels, and potatoes twelve tons. Lucerne yields have been reduced by failure of this species to persist longer than eighteen months as a highly productive stand.

HORSE SECTION

There are thirty-four in the Arab stud; twenty-two draught horses; and thirteen hacks and coach horses. The total of sixty-nine is two more than in the previous year.

Twenty-eight horses were accepted for service, including two Clydesdales.

ORCHARD SECTION

Crops.—Citrus trees blossomed heavily. The Navels set a medium crop in which the fruit did not size as well as expected. The Valencias are carrying heavy crops but the fruit is small.

Stone fruit trees made excellent growth. The older trees carried medium crops, the result of refurbishing trees following heavy pruning in the previous year. Younger peach, apricot and plum trees had crops reduced by frost.

Crops of Williams and Clapps Favourite pears were light, due to heavy losses from sunburn. The trees again blossomed irregularly, due to "delayed foliation".

Grape vines carried light crops but the berry size was good. Persimmon trees gave good yields of large-sized, high-quality fruit. Pecan yields continue to be light but are increasing. Some of the Pecan trees carry good crops, but the others vary considerably.

Investigations.—A plot of Richmond Red strawberry plants was successfully established. Growth and fruiting have been good. A second plot has recently been planted.

Further observations have been made on blossoming, pollination and fruitfulness of a group of Persimmon varieties. Descriptions of fruit and seeds have been recorded to aid identification. Seedlings have been raised for use in propagating selected varieties.

In the Washington Navel Rootstock Trial fruit samples were collected from each root-stock. These were tested for maturity and percentage juice. Variations in size of fruits from each stock were also determined and recorded.

On *Pyrus calleryana* seed extracted by different methods, germination tests were done for Bathurst Experiment Farm.

Orchard Development and Reconstruction.—More stone fruit trees were planted, to maintain different aged groups of trees for student instruction.

Renovation of existing plantings by removal of couch grass sod continued. The orchard is now completely under a system of summer cultivation. Trees have shown a marked response, in growth and yields, to this and other cultural treatment.

Part of the citrus plantation was removed according to plan, and this land has been prepared for deciduous fruits and vine plantings. A group of Valencia trees was "skeleton pruned" to demonstrate renovation of old trees. Results have been satisfactory.

A project bearing on use of poultry in citrus orchards has been commenced. The trees comprise a group of Valencia and Washington Navel Trees, in poor condition, and growing in couch grass sod. The birds have reduced the sod, but the trees have yet to respond.

The fruit tree nursery has been expanded. Peach, apricot, apple, grape and main citrus varieties have been propagated. Stone fruit trees are available for planting new areas this year.

Educational.—The groups of trees of different ages and varieties, and establishment of the fruit tree nursery, have made wider and more adequate student instruction possible.

Demonstrations in various horticultural practices have been given also to visiting students of Sydney Technical College.

SHEEP AND WOOL SECTION

Experimental Work.—The fat lamb grazing trial continued, comparing production on irrigated improved pasture with that on natural pasture and grazing oats. However, it is to cease in July, 1960, for a change to production per acre investigations, using fat lamb raising as the medium.

A pilot trial to determine the fertility of ram semen after periods of storage was commenced, in co-operation with the University of N.S.W.

Lectures and Demonstrations.—In the course of major staff changes, lectures and demonstrations fell behind schedule. The lag will be overtaken.

Staff.—The Lecturer in Sheep Breeding and Management, Mr. K. T. Payne, resigned to take up a property on King Island. Mr. D. Lundie-Jenkins replaced Mr. Payne as Lecturer. Mr. J. Surgeon (East Sydney Technical College) continued as Instructor in Woolclassing.

Statistics.—The sheep on hand at 30th June, 1960, totalled 973, comprising:—

Romney Marsh Stud (ewes and rams)	107
Commercial flock ewes	498
Commercial flock rams	52
Ration sheep	316
Total	973

Shearing in 1959-60 yielded 40 bales of wool, weighing 13,463 lb.

DAIRY CATTLE SECTION

Friesian Awards at Shows.—A team of 17 Friesian cattle was exhibited at the 1960 Sydney Royal Show and gained 20 awards. These included Junior Champion Bull, Reserve Senior Champion Bull and eight firsts, three seconds, four thirds and three fourths. This made the College the second-most successful exhibitor in the Friesian section. A team was also exhibited at the Hawkesbury District Show. Awards received included that for the Most Successful Exhibitor and seven firsts, seven seconds and six thirds.

Friesian Stud.—Births totalled 64, comprising 36 bulls and 28 heifers, compared with 64 in 1958-59, comprising 22 bulls and 42 heifers. There are 155 head in the stud.

Stud Sales.—Seven Friesian bulls were sold for £728 14s., and nine females were sold for £677 5s. The revenue of £1,406 was less than in 1958-59 when 42 head of stock were sold for £1,934, but the average price was far greater.

Of particular interest was the sale by auction at Sydney Royal Show, of "the young Friesian bull" Hawkesbury Lady King, Junior Champion. He brought 310 guineas.

The demand for all Friesian stock has continued high, and there is a large waiting list for both male and female stock.

Breeding Programme.—An analysis of the Friesian females shows that, excluding purchased cows, the females are sired by no less than 16 bulls.

There are now six daughters of the imported bull "Snider's Fond Hope King" milking in the herd. A preliminary survey in Canada has shown that eleven of his daughters, as 2 year olds, averaged 11,125 lb. milk and 399 lb. butterfat at a 3.6 per cent. test. None of his stock has yet completed a record in the College herd but, on present indications, those at present milking should approach those figures.

Eleven daughters of "Fintdave Theo Conqueror" (Imp. U.K.) are also milking, and showing promise.

Milk and Butterfat Production Performances 1959-60.—Highest milk producer was "Frasea Countess Dekol Romeo", imported from Canada in 1955. Her results were 18,782 lb. milk and 614 lb. butterfat in 365 days. Her son by the imported Friesian bull "Snider's Fond Hope King" is at present being used in the herd, and he was Reserve Senior Champion bull at the 1960 Sydney Royal Show.

The highest butterfat produced was "H. Champion Lenora". She produced 17,547 lb. milk and 656 lb. butterfat in 365 days.

Herd Average.—A preliminary survey has shown that thirty-three cows averaged 12,848 lb. milk and 450 lb. butterfat, an increase over the preceding year, when forty-five cows averaged 11,440 lb. milk and 409 lb. butterfat. The increase has reflected a much better season, with pastures at a peak for a long period.

BEEF CATTLE SECTION

Poll Hereford Stud.—This stud now comprises twenty-four adult females, fifteen heifers, eight young bulls and three older bulls, a total of fifty. "Pylara Taurus", who has been used since the stud was founded in 1956, is to be transferred to Berry Artificial Stock Breeding Centre. Dananbilla Hector 2nd, is at present being used. Stock have not been born to him as yet. A young bull "Pylara Jock", was purchased from Pylara stud for 800 guineas. When his health tests are completed he will have limited use for a season, before being used as a herd sire.

Four young bulls were sold for a total of 485 guineas.

PIGGERY SECTION

Livestock.—A Berkshire boar was introduced from Mr. W. Collins' stud at Casino. Thirty-six litters were farrowed during the year.

Stock numbers were reduced during the latter half of the year, the total monthly figure for this period being approximately 150.

Present Breeding Stock.—This comprises 7 Tamworths (1 boar, 6 sows), 9 Berkshires (2 boars, 7 sows); 10 Large Whites (2 boars, 8 sows), for a total of 172 at 30th June, 1960.

Sales of Stud Stock.—The market remained buoyant, and demand for stud pigs was consistent. Fifty-four head of stud stock brought £1,561, and in market sales thirty-five realised £607.

Total Stock on Hand.—The total at 30th June, 1960, was 141, compared to 172 at 30th June, 1959.

Schools and Demonstrations.—Demonstrations were given to Sydney Technical College students, and to Agricultural Bureau Congress delegates. A School for Pig Raisers was conducted.

POULTRY SECTION

Breeding.—Poultry and Turkey breeding operations were carried out.

The sire-family method of selection of breeding stock, commenced in 1956, has continued. It has considerably enhanced the College flock in general average production, fertility, hatchability of breeding eggs, and general egg quality.

Forty, day-old White Leghorn pullets and forty, day-old Australorp pullets were submitted for testing under the Accredited Poultry Breeders Random Sample Test.

Egg Laying Competition.—The Fifty-eighth Egg Laying Competition concluded on 22nd March, 1960. A full report has been published. A team of Rhode Island Reds achieved a record production of 1,667 eggs in 365 days. The Fifty-ninth competition commenced on 1st April, 1960.

Random Sample Tests.—The Seventh Random Sample Test concluded in December, 1959; 500 days from the actual hatching date of each sample. The Eighth Random Sample Test commenced in August, 1959, and will proceed for 500 days.

At the request of the Poultry Advisory Board a Random Sample Test (Meat Production) to compare the efficiency, in growth rate and feed conversion, of special meat strain chickens and cockerel chickens of egg producing strains was conducted. A full report of both tests was published.

Accredited Breeders' Random Sample Test.—The Second Accredited Breeders' Random Sample Test, commenced in August, 1958, concluded in December, 1959; 500 days from the actual hatching date of each sample. A full report was circulated to all breeders and the poultry industry press. The Third Test commenced in August, 1959, with fourteen entries.

Annual Poultry Farmers' Field Day.—This was held on 14th May, 1960, with a record attendance of 1,300 from the industry and its suppliers. On this occasion, thirty-five trade exhibitors who cater for the poultry industry displayed merchandise. A special innovation this year was a large-scale chicken barbecue; 700 barbecued meals were served.

Eggs Collected.—Some 497,458 eggs were collected; including 336,328 from College flocks, and the remainder from competition teams and Random Sample Tests.

APIARY SECTION

General.—Excellent spring breeding conditions enabled the overwintered colonies to build up numerical strength by the end of October, 1959. In addition, eighty nucleus colonies were established for queen rearing purposes.

Most of the productive hives had to be moved to Bathurst Experiment Farm in order to secure a crop of choice honey from Yellow Box Trees. The hives were moved to Bathurst early in December, 1959, and were brought back to the College and district in the autumn.

River Farm Apiary as Mating Station.—The College River Farm apiary has been determined as an isolated mating station, for mating hybrid queen bees with selected drones. Twelve hives have been placed there. They were queened with two-way hybrid queens, developed by controlled breeding through artificial insemination. These will now be tested under field conditions.

Two queen bees were imported from New Zealand. These will be used in the breeding programme during 1960-61 season.

Sale of Queen Bees.—Over 100 queen bees were supplied to apiarists.

Summer School.—The Summer School in Apiculture was held from 6th-16th January, 1960. There was an attendance of sixteen bee-farmers.

Disease.—The first outbreak of American Brood Disease in the Hawkesbury district for years, was reported in February, 1960. Inspection revealed four hives to be infected and these were consequently destroyed.

Staff.—Mr. W. D. I. Smith, H.D.A. 1959, was appointed to the Apiary Branch and has spent some time at the College apiary for experience on a number of occasions.

Statistics.—There were seventy-six hives at 30th June, 1960, compared to fifty a year earlier. Honey production for the twelve months was 5,460 lb.; compared to 2,620 lb. in the preceding year.

VETERINARY SECTION

Disease Control.—The dairy and beef herds were maintained on the Tubercle Free Herd Scheme. Survey testing for Brucellosis and Mastitis were carried out. Vaccination for Brucellosis continued.

Sheep vaccinations for Enterotoxaemia and Tetanus were continued. Preliminary examinations for fertility commenced.

The swineherd was maintained on the Brucellosis Free Herd Scheme; and was tested for tuberculosis with negative results.

The poultry flock was tested for Pullorum Disease under the Pullorum Free Flock Scheme with negative results. The young birds were vaccinated for Fowl Pox and Laryngotracheitis.

Horses were vaccinated for strangles and tetanus. Fertility examination of the Arab stud mares was begun. Control of internal parasites continued.

Extension.—Lectures and demonstrations were given to the various winter schools for junior farmers, poultry farmers, pig farmers, and the Agricultural Bureau Congress. The nucleus of a collection of colour slides on various animal diseases has been established, to enhance future extension work.

Investigations.—Studies of blood in sheep, poultry and horses, and on fertility in sheep, have commenced.

AGRONOMY SECTION

District Work, and Extension.—Weed control trials, vegetable trials, and pasture demonstrations were carried out on farmers' properties in this district. In addition, vegetable, weed control, and plant nutrition trials were set up in other districts by College agronomists.

Information and advice have been given to people by telephone, letter and personal contact. Enquiries covered a wide field but tended to be concentrated on vegetables, weed control and pastures. The agronomists also addressed field days and farmers' schools. An inspection of tomato and bean variety trials was provided for seed firm representatives. An inspection of weed control demonstrations was conducted in the Port Macquarie area.

General Crop Production.—Except for short periods during the year, the College kitchen was supplied with vegetables, grown by this section's staff in the Vegetable Garden and at the River Farm. Vegetables were also produced for use in the Cannery and for the C.S.I.R.O. Division of Food Preservation.

Technical Reports.—Technical reports for the year, submitted to Division of Plant Industry by individual agronomists, covered their plant nutrition research, vegetable research, field crops research, weeds research, and pastures research. The contents would be incorporated in Plant Industry Division's report. Brief reference to their coverage is included in the following paragraphs.

Plant Nutrition Research.—Glasshouse soil fertility investigations continued. These included soils testing as well as specific studies. The work has been done in co-operation with Chemistry Branch of the Science Services Division.

A large number of soils has been tested for deficiencies. Routine trials have been sited in County of Cumberland, and the Maitland, Taree, Lismore, Rylstone, Coleambally and Cowra districts. In addition, soil samples were received from Wagga, Pilliga, Hanging Rock, Tamworth, and Deepwater for analyses.

Specific nutritional investigations included: influence of molybdenum treatment on maize; effect of black soil scarab on soil fertility; defective growth of lucerne in the Taree area; lucerne growing in the Cowra area; defective lucerne growth at Agnes Banks; defective lucerne growth on Pitt Town alluvial soil; grades of superphosphate; and effect of washing sand from Mount Hibbard, on its lime and potash requirements.

Vegetable Research.—The general trials included: effect of potash and boron on cauliflowers; effect of gibberellic acid on tomatoes; and effect of selective gametocide FW-450, on tomatoes.

Vegetable Breeding and Introductions.—The testing of introductions, and the breeding programme, included work on rockmelons, watermelons, cauliflowers, stringy and stringless beans, tomatoes, peas, capsicums, cucumbers, and onions.

Field Crop Research.—This comprised the testing of varieties of oats; the testing of late, mid-season and early maturing maize hybrids, a variety trial and a spacing trial with sweet sorghum; saccharine selection; testing Russian Comfrey, spacing and sowing rate trials with *Sorghum alnum*; and the effect of lupins on fertility build-up for *Sorghum alnum*.

Weed Control Research.—Weed problems in vegetables, pastures and horticultural plants were investigated.

As a result, large-scale commercial application of weed control techniques have been made possible in vegetable growing.

The effects of soil moisture and temperature on the action of herbicidal chemicals is being investigated.

Pastures Research.—Work has been conducted on the following problems: effect of height of cutting and nitrogen fertiliser applications on the yield of H1 Ryegrass, Bacchus Marsh subterranean clover, and Ladino white clover; effect of nitrogen fertiliser on the composition and yield of (i) a Bacchus Marsh subterranean clover sward and on (ii) a Ladino white clover sward.

In respect of pasture management and pasture utilisation, a comparison is proceeding of: native non-irrigated pasture supplemented by grazing oats and millet, versus grazing on improved irrigated pastures for fat lamb production. It has been deduced that the irrigated pastures could carry 7-8 ewes per acre on a yearly, whole farm basis. Carrying capacity of the native pastures would, in contrast, be about $\frac{1}{2}$ ewe per acre on a yearly basis.

Pasture Species Trials.—Early work was concerned with introduction and testing of new species and strains in the nursery, and field testing of the most promising. For the past 3 years, the work has concentrated on gaining a better knowledge of the potential of these species. Production curves showing responses to height of cutting, fertiliser treatment, and irrigation are proceeding.

DAIRY TECHNOLOGY SCHOOL AND DAIRY PRODUCTS FACTORY

General.—The School operated at a high standard throughout the year. Intake of milk and cream allowed practical student training comparable to that of previous years.

Apart from dairy industry apprentices in residence as diploma students of the College, there are 36 other apprentices and all but one of these spent a week at the College in mid-June.

More interstate enquiries are being received for a place at the College for students. At present students are enrolled from all States. Cadetships schemes had been commenced by the South Australian and Western Australian Departments of Agriculture. Western Australia has one cadet in first year and one enrolled for 1961, and South Australia will be enrolling two in 1961.

Instructional Visits.—Second year students attended two sessions of the New South Wales Division of the Australian Institute of Dairy Factory Managers and Secretaries, held in Sydney in May, 1960. They heard instructive addresses by leaders of the industry; they also participated in open, grading competitions in respect of butter, cheese and cream. They gained seven out of nine places.

Factory Plant, Equipment, and Operation.—The School of Dairy Technology, has operated in the present building for five years and maintenance of original equipment has become a problem. Worn items are being replaced where possible.

The wooden Zero butter churn has been replaced by a stainless steel, controlled temperature churn. It has enabled students to be trained on the most modern equipment. A change over from wirebound to cardboard butter boxes was also made, with lower packing costs. The ice cream freezer churn was replaced in August. The replacement, a stainless steel unit, has proved satisfactory.

The milk bottling plant caused numerous stoppages. The bottle washing unit is liable to breakdown, is not big enough for the developing trade, and needs replacement.

Re-equipment of the cheese section is proceeding to handle film wrapped cheeses.

Hygienic Containers Pty. Ltd. donated a Perga "M" Carton-ing Machine in January, 1960, for student training in cartoning whole and flavoured milk. All milk going into cartons is being homogenised, thus students have become familiar with the homogeniser unit.

Authority has also been given for the College to carton "Ice Cream-Mix" for the local trade, thus students have gained more practical experience in ice cream-mix manufacturing.

Demonstrations in sweetened condensed milk manufacture have been carried out. By arrangements with the College Cannery, the condensed milk was canned. It is used in the ice cream manufacture, and by the College kitchen. When the College is ready to enter into trade agreement regarding sales, a ready market is available for the condensed milk.

New equipment and replacements provided in the past year, and those sought for 1960-61, will permit this School of Dairy Technology to maintain its position as one of the world's outstanding dairy technology teaching establishments.

Production.—Milk and cream intake from the district was steady from June, 1959, to February, 1960; but from March, 1960, to early June, 1960, supplies were very light. The New South Wales Milk Board therefore arranged 2,000 gallons of milk per week, to enable student training to continue.

The system of a tanker of cream from Dairy Farmers' Milk Co. weekly from June to February was discontinued. However, there has been sufficient cream for student training.

Cheese production has been lower, due solely to one vat being out of production for three months through a breakdown in equipment. A market through Government Stores Department has been obtained for the bulk of the cheese. This has reduced carryover from 800 last year to 10 this year.

Production of dried milk has been well maintained. Two price adjustments occurred. Local sales can clear all College stock at £90 per ton, a rise of £20 by comparison with the preceding year.

Bottled milk trade increased and the rise should continue, as the district population increases. Flavoured milk in cartons has been satisfactorily launched on the market, some 350 gallons per week have been sold. Sales increased 15 per cent. in mid-June when a choice of three flavours was introduced.

The factory statistics show all-over production for the year to have been as follows: butter, 388,181 lb.; cheese, 139,918 lb. cheddar and 1,244 lb. fancy; milk, 6,323,291 lb.; ice-cream, 1,896 gallons; dried milk, 95,353 lb.; flavoured milk, 34,835 cartons ($\frac{1}{2}$ pt.).

Dairy Research.—Dairy Research Officer Mr. G. F. Smith is still absent on study leave in U.S.A. It has become necessary to advertise for additional staff.

Through the Australian Dairy Produce Board, funds have been made available to the Department of Agriculture for research into blue veined and allied cheeses and processed cheese at the School of Dairy Technology.

To date, no appointment to the research staff has been possible despite repeated advertisements. It has become a matter of urgency.

Appointment of a chemist to work with a research team has been approved of. The chemist will also carry out analytical work associated with the Dairy Division's work within dairy produce factories.

The provision of adequate laboratory accommodation for a dairy research team, in an overall College research building, is being considered.

Milking Machines Research.—Funds to extend the milking machine research programme did not eventuate, because of a decision to concentrate on manufacturing problems. However, appointment of a field assistant relieved the Research Officer of some routine duties and allowed development work.

Work undertaken included development of new principles in the operation of the vacuum recorder, and testing of air flow meters and vacuum regulators. Several air flow meters were tested and certified for private firms, including a couple interstate, and for the Department. Improved udder-washing techniques have also been tried.

Co-operation between the Department and the University of Sydney in milking machine research is now on a firm basis. A joint committee has been established to co-ordinate the work.

Good progress has been made in drawing up standards of performance of components; and in particular the College undertook to provide data on the performance of vacuum regulators. This was done.

The next step for the College is testing of commercial models submitted for certification in compliance with an agreed standard, to be determined shortly. Testing of other components will follow.

To cope with this work, and testing of new materials such as plastics, plans are being drawn up to convert the disused section of the College bails for the purpose.

Testing of milking machines under the Survey scheme continued to be one of the best services offered to farmers.

A fourth Survey Officer has been trained, and appointed to the Coff's Harbour district. Refresher courses were conducted for dairy officers and herd organisers. All appropriate officers in the State are now competent to carry out tests if required.

The mastitis survey has commenced in pilot form in Taree area. Other districts, including the Parramatta and College areas, will be brought into it in the near future.

FOOD TECHNOLOGY SECTION

Association with Industry.—Close contact has been maintained with industry by the Food Technology lecturing staff. This continued to benefit the Food Technology Diploma course. It resulted in direct assistance, including equipment, from the industry, as well as interchange of information on new technological practices.

In conjunction with the Food Technology Association of New South Wales, a winter school entitled "The Foreman in the Food Plant" was successfully conducted at the College. This course was attended by forty-four representatives from industry.

Close liaison has been maintained with the C.S.I.R.O. Division of Food Preservation and Transport. Some of the external examinations of students have been conducted by research officers from this C.S.I.R.O. Division.

Equipment and Facilities.—Equipment loaned or donated by the industry included a Bingham Model I.C. Filler, a chemical feed pump for pumping hypochlorite solution into the water supply and a steam blanching tunnel.

Modifications to the former bacon factory have almost been completed, thus practical meat processing instruction will commence in 1961.

Processing Operations.—Over seventy different packs were processed by Food Technology students in the past year. Supplies of raw materials for processing were mainly from the College and other Experiment Farms. A few items, such as tropical fruits, and cherries, were purchased through Government Stores. All vegetables processed were grown on the College.

Production of processed vegetables amounted to more than 19,000 lb. of consumer product, comprising 16,000 lb. canned vegetables, 250 lb. dehydrated vegetables, and 3,000 lb. quick frozen vegetable produce.

Vegetable products and specialities comprised 1,530 pints of tomato sauce, 600 x 16 oz. cans of soup, 250 x 16 oz. cans of mustard pickles, 250 x 16 oz. cans of pickled cabbage, 500 x 16 oz. cans of spaghetti, and 2,600 pints of tomato juice.

A commercial range of vegetables was processed in the canned, dehydrated and quick frozen forms. They included asparagus, beans, carrots, cauliflowers, cabbage, beetroot, peas, tomatoes, broccoli, sweet corn, onions, gherkins, and parsnips.

Fruits and fruit products processed amounted to over 26,000 lb. of produce. Canned fruits totalled 14,000 lb., and fruit pulps 11,500 lb. of produce. A small amount of dehydrated fruits was also produced.

The fruits processed were apricots, apples, grapefruit, grapes, peaches, pears, cherries, plums, prunes, oranges and lemons. Supplies of fruit were drawn from the various Experiment Farms of the Department, but the citrus fruits were supplied by the College Orchard.

All College requirements of jam, 8,000 lb., were supplied by the cannery. Most of the pulp for the jam was processed at the cannery.

WAGGA AGRICULTURAL COLLEGE AND EXPERIMENT STATION

Student Enrolment.—A new peak, ninety-six students, was reached in February, 1960. Of this total, forty-three new students was the highest number ever to be admitted in one year. This was made possible by an abnormally high wastage rate in the 1959 First Year Class. There were thirty-four in that Class, but eleven of them left voluntarily or failed to qualify for Second Year.

Numerical balance between the three years was restored by admitting to Second Year eight of the forty-three new students who were adequately qualified.

The ratio between the number seeking admission and the number it was possible to admit continued to increase. In 1960 it was 5 to 1.

Comparisons of student numbers for each of the past five years have been tabulated:—

ENROLLED STUDENTS

	1956	1957	1958	1959	1960
Third Year.....	21	21	25	29	30
Second Year.....	22	28	32	31	31
First Year.....	30	30	37	34	35
Totals.....	73	79	94	94	96
Percentage of Assisted students	28.4	32.9	30.9	34.0	28.1

Of the total admissions in 1960, the percentage with only the minimum qualifications fell to 18.6, indicating a sharp rise in the overall, academic, pre-entry standards.

Diploma Examinations.—One of the twenty-nine final year students in 1959 left during the year. The remaining twenty-eight successfully completed the Agricultural Course. Four graduated with Honours.

All ex-students diplomate numbers to date have been tabulated:—

Diploma	Standard	Year of Graduation			Totals		
		1951-54	1955-58	1959	Honours	Pass	All
W.D.A.	Honours	6	11	4	21	154 }	175
	Pass	57	73	24	..		
Other Diplomas*	Honours	4	..	..	4	10 }	14
	Pass	10	..	..	..		
Totals		77	84	28	25	164	189

* Students who commenced at Wagga but completed their diplomas in courses at other Colleges—Hawkesbury 13, and Queensland 1, (9 H.D.A.: 4 H.D.A. (Hort.): 1 Q.D.A.).

Statistics of Ex-student Occupations.—At 30th June, 1960, there were 260 ex-students (excluding two deceased, and students who were in residence for less than one session). The vocational activities have been classified:—

(1) Following agriculture—	
(a) On farms	152
(b) In Government Departments, Com-	
missions or boards—	
Agriculture	28
Soil Conservation	8
Education	5
A.B.C.	2
Rural Bank	1
Valuer-General	2
Milk Board	3
	49
(c) Undergoing University training	3
(d) In commercial firms	20
Total following agriculture..	226
(2) Left Agriculture	12
(3) Occupations unknown	22
Total	260

Assuming that a few in the third category are following agricultural pursuits, approximately 90 per cent. of the total are so doing.

Students' Tours.—Three regular educational tours were undertaken, each of approximately one week's duration: to the Central and Southern Tablelands in October, 1959, to Gundagi-Tumut-Batlow-Tumbarumba in November, 1959, and to the Murrumbidgee Irrigation Areas in March, 1960.

Various half- or one-day tours were conducted: to the Soil Conservation Research Station, the abattoir, the saleyards, bacon and dairy factories, and several sheep and cattle stud properties in the district.

Students gained further experience by acting as stock attendants and/or by competing in stock and produce judging competitions at the Royal Easter Show, Sydney, the Murrumbidgee P. and A.A. Show, Wagga, and the Wagga Ram Show and Sales, and by visits to wool stores and woollen mills.

Curriculum, External Aid.—The College was assisted by: Wagga Wagga Technical College in teaching Business Principles, Bookkeeping, Mechanics, Farm Engineering, Tractor Maintenance, Wood Work, Metalwork and Woolclassing, by the Department's Division of Marketing and Agricultural Economics in teaching Economics and Farm Management, and Division of Information Services in a training course in Leadership and Extension Methods, by the Regional field staff



Student Tours are Features of Hawkesbury and Wagga Agricultural College Curricula
A "Water-harvesting" project on a Tarcutta property captured the interest of this group from Wagga College.

in instruction in Apiculture and Poultry Raising, by Hawkesbury Agricultural College in Saddlery demonstrations, and all senior students received the benefit of two days additional practical instruction in shearing, from an outside specialist in this art.

A few who could cope, without prejudice to the College requirements, were encouraged to pursue related studies, extra-mural, in Meat Inspection and in Welding.

Course Modifications Suggested.—Sweeping modifications to the course as a whole have been suggested, the better to meet the varying needs of students with respect to their future intentions. The suggestions changes are under thorough investigation.

Winter, Short-term Schools.—During the College winter vacation the following schools occurred: the ninth Junior Farmers' School in Wheat and Sheep Husbandry (attendance twenty-one), and ninth Turkey Raisers' Convention and School (attendance fifty-five).

For the fourth time, second year Agricultural Science students from the University of Sydney came into residence for two weeks tuition in Farm Machinery and practical Animal Husbandry (attendance 52).

Students' Extra-Curricular Activities.—The usual regular annual competitive sports were engaged in by students locally, and teams travelled to Longerenong College (Victoria) for annual inter-Collegiate rifle shooting and tennis matches.

Wagga Wagga District Ambulance staff conducted the sixth annual First Aid class and examinations, for all new students.

Intra-mural debating and public speaking contests were held. An excellent amateur band came into existence and rendered valuable service to regular social occasions. Students collectively were encouraged to render personal service to various local charitable organisations with good effect.

A well-attended annual Field Day was held in October. Officers of the Regional Advisory Services and the Agricultural Research Institute effectively co-operated.

A College Swimming Pool Fund Committee was set up, and opportunity was taken to launch the appeal publicly on Diploma Day, May 7, 1960. The continued public response and staff and student efforts have raised £3,000 to date.

WORKS AND IMPROVEMENTS

The immediate surrounds of the administration buildings and campus are taking on the park-like appearance envisaged in the original landscape design.

This effect has been assisted by fencing the College oval; three new tennis courts—one of which has lighting; bitumen sealing of a basketball court, illuminated for night play; and the now complete grassing of the oval, on which a turf wicket was established and used throughout the 1959-60 summer competition.

A further 30 chains of College roads was sealed and the "street" in front of the Administration Building was sheeted with bitumen.

Serious breakdown of the main boiler led to installation of a further unit. This will become a standby on restoration of the original unit. A further new office and store were erected to house the Livestock Officer (Pigs). Work was commenced on the re-location of the stud-horse section. Work was completed on the handyman's shop (30 ft. x 20 ft.). A further farm storage shed was erected (40 ft. x 18 ft.). Roads and culverts in the farmstead area were re-designed and re-formed.

Drainage of the Research Institute effluent and the Graham Block storm water was completed. This cleared the way for completion of current landscaping north of the campus. Between this area and the main turkey section to the south, a good deal of earth-moving is required to reclaim the now disused dam south of the old apiary.

Ramps were constructed to the Beef Cattle section and on both sides of the Gap Road. The ramps give rapid access to the main western section of the College property.

In that western section, following proposals to acquire a river farm property for irrigation teaching purposes, a detailed inspection suggested a better alternative, viz., development of the land nearest to the Murrumbidgee River for irrigation teaching purposes. This has received Ministerial approval.

On the opposite side of the College property a two-target rifle range has been completed.

A new turkey demonstration unit, providing completely modern facilities and incorporating the best ideas from American and local experience, was completed in time to be of value for the 1959 Turkey-raising school. It provides for a major increase in commercial production, but, more importantly, a proper start for investigational work in feeding, breeding and rearing, as well as providing for random-sample testing.

A liberal maintenance appropriation enabled further overtaking of the backlog in repairs to all buildings. There are further references to minor works and improvements, under the appropriate sectional headings which follow.

Sectional Operations at Wagga

COLLEGE FARM

Due to the dry season, the area cropped was only two-thirds, and per acre yields about 60 per cent. of the area and yields in the preceding year—when the grain harvest was a record.

Wheat crops grown on 256 acres this year yielded 4,112 bushels, 104 acres of oats yielded 2,130 bushels, and 15 acres of barley yielded 558 bushels, for a total grain harvest of 6,800 bushels from 375 acres. In addition 75 tons of cereal hay, 55 tons of lucerne hay and 140 tons of silage were gathered and conserved.

Sown pastures were increased from 710 to 875 acres. Dry weather prevented an extension of the total area sown to lucerne. It remains 220 acres.

Fencing work included two miles of boundary and 2½ miles of subdivision fences replaced and a further half-mile of boundary fences repaired.

Major items of new plant acquired were a forage harvester, a combine, a fire-fighting tank, a second-hand crawler tractor, an additional truck for general farm transport and as a transport auxiliary to the omnibus, plus a new truck to replace an older utility truck.

AGRONOMY SECTION

Foundation Pure Seed Production (Cereals).—A small carryover (145 bushels) of barley from the 1958-59 harvest was re-graded and bagged to control grain moth. Some 400 bushels of Foundation barley seed of four varieties were graded and dusted. One other variety had to be rejected for seed purposes, because of excessive smut infection. Most of this 400 bushels was distributed to Registered Seed barley growers, or sold to farmers, or transferred to feed, or went to other experiment farms for seed. Five bushels of the variety Research from the Victorian Department of Agriculture will form the source of future supplies of this variety. Because of the loose smut problem all seed for Foundation Seed areas has been hot water treated, and long and short rows have been sown to improve trueness to type and freedom from loose smut.

Approximately 360 bushels of carried over Foundation wheat seed, of seven varieties, were regraded and treated for control of grain moth. A similar quantity from areas harvested last summer was graded and dusted, and a like amount from Trangie and Condobolin Experiment Farms brought to approximately 1,000 bushels the total so treated. Of this, some 424 bushels were supplied to registered seed wheat growers. A similar quantity was held in reserve. The remainder was sold mostly to farmers as seed.

Ninety bushels of the new unnamed wheat crossbred M. 972 were harvested, graded, treated and despatched to registered seed wheat growers. A small quantity of the crossbred MUOD 48 was graded and stored for the Agricultural Research Institute. A quantity of Festival, surplus to needs, was supplied to Tamworth Experiment Station for sowing.

A small supply of Burke oats is still on hand from the 1958-59 harvest. Twelve acres sown in 1959-60 had to be rejected for black-oat infestation.

Agronomy Experiments.—The soil tillage trial in co-operation with the University of N.S.W. was discontinued.

Lucerne establishment and management trials point to negative results in the use of inoculum and molybdenum in establishment, and the dry season did not favour mowing as an economic proposition by comparison with careful grazing. Results of renovation trials are still inconclusive.

ORCHARD SECTION

May, 1960, was the only month in twelve when sufficient rain fell to maintain reasonable moisture in the tree root-zones. From November, 1959, growth was at a standstill. There was early defoliation, considerable die back, and shedding of blossom. Ultimately, practically all fruit was very small in size. Even the butt measurements of trees showed appreciable shrinkage in some cases.

Despite the season, student practical instruction was not seriously hampered and all normal practices were demonstrated and practised—propagation, planting, shaping, pruning, disease and pest control, irrigation, harvesting, packing, drying, canning and bottling.

Tillage was only necessary twice during the year. Some new ground was worked for planting to maintain the sequence for future student instruction, and a new nursery site was established.

Nursery work was carried on for student instruction in building, grafting and propagating. The provisions of young stock for future plantings for pruning instruction and budding for use at the College and other farms, was carried on to the limit of bud-wood available.

A large section of almond plantings was removed, mainly because harvesting and handling was making inroads into more important phases of student instruction. The area of olives was reduced for the same reason.

ANIMAL HEALTH AND HUSBANDRY

In general there has been no outstanding health problem during the last twelve months.

Poultry Section.—Routine testing and vaccination have been carried out as required.

Few diseases have been encountered during the year. Low hatchability in turkeys has received attention, and a small trial will be conducted during the coming year; on the value of various nutrients in raising the hatchability figure.

Dairy Cattle Section.—Milk fever continued to be the main worry. Almost 80 per cent of cows on their third calf or over, show symptoms of this metabolic disease. A trial has begun, in conjunction with Glenfield Veterinary Research Station, on the value of Vitamin D₃ as a preventative.

Pig Section.—Infectious pneumonia is approaching 70 per cent incidence. Submissions have been made, to institute an eradication programme. There are few piggeries in Australia from which this disease has been eradicated. It would provide a good demonstration to students in disease control.

Sheep Section.—Investigations of the low lambing percentages among the Dorset Horns have continued. It seems that in part this may have been due to low ram fertility, the cause of which is not yet clear.

Beef Cattle Section.—Few calls have been made for veterinary attention. However, a recent examination of the calving percentage in the stud herd showed a figure below 20 per cent. This will be investigated.

DAIRY SECTION

Herd Production.—Herd production declined; partly due to the season and partly because ten of the thirty animals under test were first-calf heifers. Thirty cows under test gave an average of 398 lb. butterfat (430 in 1958-59) and 7,929 lb. milk (8,722 in 1958-59).

The cow "Yanco Conqueror's Birdseye" topped the herd with 11,500 lb. milk and 687 lb. butterfat in 300 days, bringing her total in four (300 days tested) lactations to 45,570 lb. milk and 2,571 lb. butterfat.

Numbers.—Natural increase in the herd was twenty-four males and twenty-four females. Four females and one male were purchased recently. Deaths from various causes were five females and four males. Sales to the value of 943 guineas included thirteen bulls and two heifers. Culls included one bull and four females. One bull was loaned to the Milk Board for artificial insemination purposes.

Exhibits.—The College Jersey exhibit at Wagga Show gained awards including that for the Champion Jersey bull, and cow; and for the best cow of any breed, for type and/or production. Although eight animals exhibited at the Royal Easter Show, Sydney, only gained a third prize, great interest was shown in three "Orange Boy" heifers.

Weights and Measures.—Birth weights and measurements continued to be recorded for the herd.

Solids-not-fat.—All equipment is now to hand for the solids-not-fat trial, and a start will be made in July, 1960.

Improved Type of Stock Through Sire.—The bull "The Mount's Orange Boy" (imp.), now at Berry Artificial Stock-Breeding Centre, lifted the type considerably; particularly in regard to udder shape and strength, and overall Jersey type. Lightness in the lower jaw-bone and plainness over the rump are the main weaknesses, and the latter seems to improve with age. Production so far from these heifers is most encouraging. It is too early to comment on the progeny of the other two stud sires.

Stud Sales.—Stud sales have been at the highest practicable level. The purchasers' waiting list for both male and female stock exceeds the likely supply for twelve to eighteen months ahead, and every available animal on the farm is allotted.

New Equipment, etc.—New dairy equipment comprised two calf feeding units and a stainless steel milk vat.

Bull yard fences were strengthened. An experimental service crush has been erected. This, if successful, will be duplicated in the other yards. Modifications of the milking shed layout have improved working efficiency.

PIGGERY SECTION

Improvements Through Electricity Installations.—Electricity has been installed in all of the farrowing pens, for the use of infra-red heating lamps for newly born litters. This has yielded a considerable saving of young pigs; plus better growth, and control of diseases associated with the severe winters at Wagga.

The electricity has also enabled the installation of a power mixer for mixing of rations. With the proposal to use an "early wean" mix extensively in the future, this is most important; owing to the number of small amounts of ingredients in the mix.

Buildings, etc.—Extensions and slight re-design of the feed shed have been carried out, facilitating operation of the power mixer, etc. A demonstration deep litter shed and a Ruakura round farrowing house have been constructed, and these innovations have already been of great value in educational sessions with students and visitors.

The erection of several new fences, the laying of a new concrete path, and replacement of nearly all of the old wooden gates with new steel ones, have improved the appearance and efficiency of the Section.

A set of seven feeding stalls and holding yards has been completed and is now in good use for the dry sows. They allow much better control of the animals at feeding time.

Early Weaning Trials.—Early weaning trials have been undertaken, successfully, proving the practicability of this type of management.

Exhibits.—The College pig exhibit at the Wagga Show was successful. It gained the awards of one Champion, two Reserve Champions, twelve First and four Second prizes.

An entry was made in the District Bacon Carcase Competition.

Studs.—The Large White stud has been replaced in entirety by young stock from Hawkesbury Agricultural College, and several new Tamworths have been received from Wollongbar Experiment Farm.

STUD HORSE SECTION

Horse Numbers.—The number of stud horses at 30th June, 1960, was forty-seven (six entire, twenty-eight mares, thirteen foals); compared with forty-four on hand at 30th June, 1959. Seventeen foals were born during the year, ten sired by "Razaz", five by "Prometheus" and two by "Electric Silver". Three have since died; and one has been transferred to Hawkesbury Agricultural College.

Arab Sales.—The sale of two top quality colts for 250 guineas each, to Warren and Moree breeders, should do much to promote the Arab breed in the north.

Exhibits.—Due to U.R.T.I. in some of the entrants it was decided to withdraw the team from the 1959 Wagga Show.

A team of four was shown at the Royal Easter Show, Sydney. "Razaz" won the Championship in the Arab Section for the third time. The other three entrants were also prizewinners.

Buildings, etc.—The new stud horse section at present under construction will eliminate many of the present problems of management and operation.

BEEF CATTLE SECTION

Numbers.—Cattle on hand at 30th June, 1960, numbered sixty-nine cows and heifers, and twelve bulls.

Exhibits; and Sales.—A strong team of six bulls, and one steer, were shown at the Royal Easter Show, Sydney. It was highlighted by the sale of the steer for 350 guineas. The bulls, all by "Birmingham Nugget 3rd", were much admired. The four offered for sale averaged 425 guineas, with the top price at 600 guineas.

The private sale of three bulls, plus the Show sales, brought a gross return of 2,600 guineas.

Weight Gain Records.—Analysis of all weekly weights recorded gives the high average figure of 2.1 lb. per day weight gain. Calves with a heavy birth weight had a higher than average weight gain of 2.5 lb. per day.

Student Sessions.—The number of demonstrations given to students has been greatly increased in this section during the year.

SHEEP SECTION

No marked changes occurred in flock structure. Dorset Horn ewes comprise one-quarter of the ewe flock. Sheep totals fluctuated between 1,000 and 1,400.

Flock rams of Dorset Horn breed were supplied to other Experiment Farms and Colleges.

Proposed "Stocking Rate and Flock Management" Project.—This will commence in the autumn of 1961. The required area had to be re-sown to subterranean clover and rye grass, because of barley grass infestation of the existing pasture.

Repetability of Early Mating Characteristics.—The breeding trial concerned with repetability of early mating characteristics of two types of breeding ewes is being continued. It is in its second year and will end in 1961.

Variable Stocking Rates on Various Pasture Mixtures.—Co-operative work with the C.S.I.R.O., concerned with variable stocking rates on different pasture mixtures has been planned to commence in 1961.

Protein Supplements Demonstration.—A demonstration of protein supplements effects under drought feeding conditions has been commenced, with pen fed sheep.

POULTRY SECTION

The sheds have been stocked to capacity with pullets and first year hens. Production has been maintained at a satisfactory level. Electric lights have been used for autumn laying. An improvement plan is being applied to the Australorp flock.

Turkey numbers are being increased to stock the new breeding pens.

APIARY SECTION

No further progress has been made towards establishing the new College apiary. Hives have been maintained, as far as possible. Some were re-queened during the early spring of 1959. No new stock was imported.

E. O. TOUT, Under Secretary.

30th September, 1960.

APPENDIX I

The Accounts of the Department of Agriculture, 1959-60

The cost of maintaining the Department of Agriculture is met from the Consolidated Revenue Fund, whilst capital expenditure on buildings and permanent improvements to departmentally-owned property is financed from the General Loan Account. In addition to these general classifications of expenditure, the Department is assisted in the financing of certain specified lines of research and development and the control of insect pests and animal diseases by direct levies on industry and by grants from the Commonwealth Government and public and private organisations. Operations of this nature are reflected in a large number of separate accounts within the general Treasury classification of "Special Deposits Account", some details of which are given elsewhere in this Appendix.

COMPARATIVE STATEMENT OF EXPENDITURE

Account	1958-59			1959-60			Increase or Decrease		
	£	s.	d.	£	s.	d.	£	s.	d.
Consolidated Revenue Fund	3,579,641	18	10	3,693,323	1	6	113,681	2	8
General Loan Account	71,097	1	10	114,353	5	5	43,256	3	7
							(Increase)		
	£ 3,650,739	0	8	3,807,676	6	11	156,937	6	3
							(Increase)		

EXPENDITURE FROM CONSOLIDATED REVENUE FUND

The following tabulation is a comparison of expenditure by the functional Divisions of the Department for the last two financial years :—

Division	1958-59			1959-60			Increase or Decrease		
	£	s.	d.	£	s.	d.	£	s.	d.
Central Administration	682,286	1	2	757,732	6	3	75,446	5	1 (Inc.)
Plant Industry	207,859	5	3	228,224	12	8	20,365	7	5 (Inc.)
Horticulture	181,790	11	2	198,111	7	2	16,320	16	0 (Inc.)
Dairying	179,330	14	0	195,498	19	8	16,168	5	8 (Inc.)
Hawkesbury Agricultural College	213,679	18	2	221,332	18	7	7,653	0	5 (Inc.)
Wagga Agricultural College	102,349	1	3	107,842	9	7	5,493	8	4 (Inc.)
Experiment Farms and Stations	355,481	4	5	385,994	13	4	30,513	8	11 (Inc.)
Animal Industry—									
Head and District Offices	446,301	19	11	485,687	10	11	39,385	11	0 (Inc.)
Queensland Border	57,277	2	3	62,658	1	6	5,380	19	3 (Inc.)
Tick Quarantine Areas	1,031,548	1	1	908,819	19	4	122,728	1	9 (Dec.)
Royal Botanic Gardens	121,738	0	2	141,420	2	6	19,682	2	4 (Inc.)
Totals	£ 3,579,641	18	10	3,693,323	1	6	113,681	2	8 (Inc.)

The upward trend in salaries and wages continued during the year and, with the resultant increases in the cost of goods, gave rise to an overall increase in expenditure.

Progress continues to be made with maintenance of buildings and properties. Consequently, expenditure shown against Hawkesbury and Wagga Agricultural Colleges and Experiment Farms and Stations is higher than during the previous year.

Considerable work was carried out in the Royal Botanic Gardens and Allied Activities on road maintenance and pond cleaning. Expenditure of £16,341 for this is reflected in the sharp rise under the heading "Royal Botanic Gardens".

A holding campaign was undertaken in the Tick Quarantine Areas during the year in lieu of an eradication programme. This action was taken pending the result of certain investigations as to the most effective method of dealing with the cattle tick problem and resulted in a marked decrease in expenditure under Division of Animal Industry—Tick Quarantine Areas.

EXPENDITURE FROM GENERAL LOAN ACCOUNT

Expenditure from General Loan Account for the year was £114,353 5s. 5d., of which £36,027 19s. 1d. was spent at Hawkesbury Agricultural College; £5,921 16s. 5d. at Wagga Agricultural College and Experiment Station; £68,911 17s. 7d. at Experiment Farms and Stations; and £3,491 12s. 4d. on the Queensland Border.

An Unissuable Repayment to the General Loan Account Vote "Promotion of Agriculture" in the sum of fourteen shillings (14s.) was received.

SPECIAL DEPOSITS ACCOUNT

Other Accounts

Following is a complete list of accounts and funds within the Special Deposits Account at the Treasury on which this Department operates:—

Name of Account	Balance as at 1st July, 1959	Receipts 1959-60	Payments 1959-60	Balance as at 30th June, 1960
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Advances to Officers for Purchase of Motor Cars	Dr. 117,406 2 11	43,778 5 9	30,735 8 3	Dr. 104,363 5 5
Contribution towards Running Expenses of Tractor Mower at Centennial Park	326 19 5	94 0 0	148 10 7	272 8 10
Potato Growers' Licensing Act, 1940	790 14 9	1,866 16 6	1,688 18 9	968 12 6
Balance of Salaries Adjustment Suspense Account ..	73,537 14 9	19,685 2 5	73,537 14 9	19,685 2 5
Government Printing Office—Working Account and Stores Account and Sale of Publications		1,052 16 11	28 8 10	1,024 8 1
Noxious Insects Destruction Account	45,865 16 4	71,000 12 10	85,293 1 4	31,573 7 10
Swine Compensation Fund	101,450 16 10	21,576 6 3	20,275 12 3	102,751 10 10
Treasury Fire Risks			78 8 0	Dr. 78 8 0
Hawkesbury Agricultural College Canning Factory Account	812 17 3	2,430 14 4	2,032 18 9	1,210 12 10
Bush Fire and Flood Relief Account (State)		9,823 5 5	112 15 7	9,710 9 10
Hawkesbury Agricultural College—Dairying Factory Working Account	17,729 8 3	183,477 13 3	166,806 18 8	34,400 2 10
Tobacco Industry Trust Account	11,441 7 2	9,511 13 2	7,700 19 2	13,252 1 2
Commonwealth-State Bush Fire Relief Scheme	7,871 17 5			7,871 17 5
Pasture Control Account	10,000 0 0		1,800 0 0	8,200 0 0
Unclaimed Moneys Account	1,203 5 2	427 5 9	1,083 19 4	546 11 7
Commonwealth Grant Towards the Promotion of Improved Practices in the Dairying Industry	15,743 10 1	73,216 17 7	79,244 17 5	9,715 10 3
Argentine Ant Eradication Campaign	149 13 5	10,856 3 6	9,340 19 5	1,664 17 6
Commonwealth Grant—Expansion of Agricultural Advisory Services—New South Wales	18,564 19 0	69,248 3 11	65,794 4 0	22,018 18 11
Cattle Compensation Fund	159,599 2 10	337,011 12 9	258,827 12 11	237,783 2 8
Flood Relief Scheme, 1955	5,342 7 0		5,342 7 0	
V. P. Bragg Scholarship—Wagga Agricultural College ..	82 4 8	307 10 0	210 0 0	179 14 8
Wagga Agricultural College Swimming Pool Account ..		2,199 0 0	2,000 0 0	199 0 0
V. P. Bragg Scholarship Account (Investment)	6,000 0 0			6,000 0 0
Wagga Agricultural College Swimming Pool Account (Investment Account)		2,000 0 0		2,000 0 0
Banana Growers' Plebiscite, 1959		329 6 6	329 6 6	
French Bean Seed Marketing Board Triennial Elections 1959		10 14 8	10 14 8	
French Bean Seed Marketing Board—Conduct of Poll on Question of Dissolution		9 7 6	9 7 6	
Poll on Question of the Constitution of a Honey Marketing Board for New South Wales			2 8 0	Dr. 2 8 0
Wine Grapes Marketing Board for the Shires of Leeton, Wade and Carrathool—Triennial Elec- tions, 1959			58 15 5	Dr. 58 15 5
Argentine Ant Eradication Campaign	Dr. 2,914 0 0			Dr. 2,914 0 0
Water Supply—Shannon Vale Nutrition Station	Dr. 1,184 12 4	640 0 0	415 7 8	Dr. 960 0 0
Extending Water Supply and Construction Sheep Dip and Draining Pens at Shannon Vale Nutrition Station		631 8 6	1,234 3 3	Dr. 602 14 9
Hawkesbury Agricultural College Trust Account	5,867 1 3	6,788 0 9	9,529 2 6	3,125 19 6
Wagga Agricultural College Trust Account	2,064 18 4	2,180 14 0	2,446 1 5	1,799 10 11
Advertising—Department of Agriculture Publications Account	2,311 11 2	12,336 14 9	13,524 9 5	1,123 16 6
Trust Fund—Brown Rot Investigations	643 5 6	990 0 0	1,202 10 7	430 14 11
Commonwealth Contribution for Research into Control of Insecticidal Resistance in Sheep Blowfly	341 3 7	2,175 0 0	1,239 2 10	1,277 0 9
Commonwealth Contribution for Research into Control of Itch Mite in Sheep	75 0 0	2,400 0 0	997 17 11	1,477 2 1
Commonwealth Contribution Towards Cost of Attendance of J. C. Keast at 16th International Veterinary Congress, Madrid, 1959	800 0 0		800 0 0	
Commonwealth Grant for Additional Sheep and Wool Advisory Officers		2,625 0 0		2,625 0 0
Commonwealth Grant for Appointment of Wheat Geneticist at Wagga Agricultural Research Institute ..		50 0 0	14 14 8	35 5 4
Commonwealth Grant for the Development of a Rotary Sod-Seeder		600 0 0	200 0 0	400 0 0
Contribution by Commonwealth Towards Cost of Investigations into Excess Spray Residue on Fruit ..	2,582 0 3	2,300 0 0	2,593 10 6	2,288 9 9
Contribution by C.S.I.R.O. towards Fleece Testing work at Trangie	340 0 0			340 0 0
Contribution by Legume Inoculant Association towards Research and Service in the Field of Rhizobiology ..	20 13 0			20 13 0
Contribution by Manning District Agricultural Research Council for Pasture Research in Manning District		2,000 0 0		2,000 0 0
Contribution towards Animal Insect Pest Investiga- tions—Glenfield Veterinary Research Station	521 13 11			521 13 11
Contributions by States towards Salary and Expenses of Patrol Officer, Grasshopper Control	4,177 6 7	2,109 10 0	2,917 2 6	3,369 14 1
Contributions for Plague Locust Trial Control Cam- paign	36,323 19 9		216 13 0	36,107 6 9

Special Deposits Account—continued

OTHER ACCOUNTS—continued

Name of Account	Balance as at 1st July, 1959	Receipts 1959-60	Payments 1959-60	Balance as at 30th June, 1960
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Contributions to Pasture Research Programme—Mid-Coast and Hunter Region	1,500 0 0	1,675 10 0	1,033 19 8	2,141 10 4
Contribution towards Cost of Overseas Trip by Dr. C. J. Magee .....	.....	1,000 0 0	556 4 6	443 15 6
Contributions towards Development of Tamworth Experiment Station .....	.....	6,000 0 0	.....	6,000 0 0
Contributions towards Establishment of Library at Agricultural Research Institute, Wagga	36 15 0	.....	.....	36 15 0
Department of Agriculture Suspense Account	1,407 10 2	8,638 8 1	9,176 3 1	869 15 2
Donation by I.C.I.A.N.Z. towards Pasture Fertilizer Nitrogen Investigations	956 9 9	.....	723 4 4	233 5 5
Egg Marketing Board—Contribution for Investigations into Egg Quality	1,954 0 0	1,000 0 0	2,218 15 3	735 4 9
Fire Damage Account	448 12 0	.....	207 19 2	240 12 10
Grant by Australian Dairy Produce Board for Research Projects .....	.....	3,400 0 0	.....	3,400 0 0
Grant by New South Wales Wheat Industry Research Committee to Agricultural Research Institute, Wagga, for Frost Resistance Investigations .....	.....	6,100 0 0	.....	6,100 0 0
Grant by Wool Research Committee for Research in Galvanised Burr Control .....	.....	1,300 0 0	118 10 3	1,181 9 9
Hawkesbury Agricultural College Egg Laying Competition Prize Fund	748 1 0	337 2 0	317 10 10	767 12 2
Hawkesbury Agricultural College Swimming Pool ..	11,218 19 1	3,214 10 0	6,344 14 9	8,088 14 4
Horse Breeding Fund	142 18 10	.....	.....	142 18 10
I.C.I.A.N.Z. Scholarship in Animal Husbandry, Wagga Agricultural College .....	.....	100 0 0	100 0 0	.....
McGarvie Smith Institute—Contribution to Nutritional Research Laboratory, Glenfield	539 14 0	24 5 7	20 18 1	543 1 6
New South Wales Wheat Industry Research Committee Grant for Black Soil Scarab Investigations .....	.....	3,205 0 0	1,597 0 0	1,608 0 0
N.S.W. Wheat Industry Research Committee—Grant for expanded Wheat Research Projects, Wagga Agricultural Research Institute	1,174 14 7	4,577 0 0	4,643 4 1	1,108 10 6
New South Wales Wheat Industry Research Committee Grant for Skeleton Weed Research .....	.....	1,850 0 0	1,605 3 1	244 16 11
Pastures Protection Boards of New South Wales—Subsidy to Glenfield Veterinary Research Station ..	700 0 0	1,750 0 0	2,499 6 11	Dr. 49 6 11
W. S. Pender Memorial Fund—Interest on Bonds ..	253 12 9	31 5 0	206 5 0	78 12 9
Rice Research Laboratory, Yanco	286 0 0	.....	.....	286 0 0
Sale of Book "Farm Management and Elementary Agricultural Economics"	0 8 11	2 1 3	2 10 2	.....
Sale of Rural Training Booklets—Wagga	9 8 3	.....	9 8 3	.....
Shannon Vale Nutrition Station Working Account ..	2,030 4 5	6,155 4 0	4,502 0 6	3,683 7 11
Tropical Fruit Research Station	5,000 0 0	.....	4 10 0	4,995 10 0
Unclaimed Salaries and Wages	269 11 5	1,330 10 1	1,201 10 3	398 11 3
Wheat Industry Research Council Grant for Investigation into Possibilities of Segregation of Wheats on the Basis of Quality	1,373 9 4	4,000 0 0	5,126 9 3	247 0 1
£	441,127 1 11	953,430 13 0	892,040 10 9	502,517 4 2

Brief details of the legislation covering some of the more important of these accounts, together with short histories of the operations conducted under each of them, were given in the Annual Report for 1957-58.

The following additional information is now offered in respect of such of the accounts as appear to warrant further amplification:—

Swine Compensation Fund—

	£ s. d.
Balance at 1st July, 1959	101,450 16 10
Receipts—	
Stamp Duty	21,576 6 3
	123,027 3 1
Disbursements—	
Swine Compensation	£ s. d. 20,272 10 9
Commission on sale of Duty Stamps	3 1 6
	20,275 12 3
Balance as at 30th June, 1960	£102,751 10 10

Following a marked decrease in claims under the Swine Compensation Act, 1928 (as amended) and the consequent increase in the credit balance in the Swine Compensation Fund, the Swine Tax was reduced from 1s. to 6d. per pig as from 1st January, 1960.

Cattle Compensation Act, 1951 (as amended)

Disease	Claims			Animals			Payments		
	Reg. 5	Reg. 6	Total	Reg. 5	Reg. 6	Total	Reg. 5	Reg. 6	Total
Tuberculosis.....	1,581	1,471	3,052	4,699	2,151	6,850	£ 72,827 1 1	£ 55,728 15 6	£ 128,555 16 7
Cancer	1,450	234	1,684	1,853	253	2,106	25,950 12 4	6,067 10 10	32,018 3 2
Actinomycosis	1,478	23	1,501	1,697	23	1,720	20,331 17 4	348 11 7	20,680 8 11
Actinobacillosis	371	7	378	434	7	441	5,004 13 7	93 1 11	5,097 15 6
Pleuro Pneumonia Contagiosa ..	5	2	7	5	2	7	145 10 0	36 10 0	182 0 0
Trichomoniasis	41	..	41	153	..	153	1,769 12 8	..	1,769 12 8
Tick Fever	10	..	10	19	..	19	408 7 9	..	408 7 9
Johne's Disease	4	..	4	32	..	32	752 17 9	..	752 17 9
Vibrosis	..	..	..	..	..	..	..	..	..
Totals	4,940	1,737	6,677	8,892	2,436	11,328	£127,190 12 6	62,274 9 10	
Net Compensation paid									£189,465 2 4

SUMMARY OF RECEIPTS AND PAYMENTS

	£	s.	d.	£	s.	d.
Balance of Fund as at 1st July, 1959 (a).....				109,599	2	10
Add Receipts—						
Levy	227,647	6	3			
Less Refunds	14	4	0			
				227,633	2	3
Sale of Stamps	109,393	3	7			
Less—						
Stamps Returned	15	6	0			
Commission	25	1	1			
				40	7	1
				109,352	16	6
Add Recovery of Underpaid Duty				12	11	
				109,353	9	5
						336,986 11 8
Less Payments (a)—						446,585 14 6
Compensation	189,465	2	4			
Legal Cost	27	10	10			
Administrative Costs—						
Pastures Protection Board Secretaries						
(1st July, 1959, to 30th June, 1960) ..	2,125	0	0			
Department of Agriculture	17,184	18	8			
				19,309	18	8
						208,802 11 10
Balance of Fund as at 30th June, 1960						£237,783 2 8

(a) An amount of £50,000 advanced by the State Treasury to cover any temporary excess of payments over receipts, and which was repaid to the Treasury during the currency of the year, has been excluded from these figures, in order that the true position of the Fund may be shown.

Commonwealth Dairy Industry Extension Grant

The Commonwealth Government has agreed to the continuance of the grant for a period of five years to expire on 30th June, 1963, under the terms and conditions set out in the Department's report for the year ended 30th June, 1953.

The first grant was received in October, 1948, and the expenditure to 30th June, 1960, amounted to £758,904 18s. 5d. under the following headings :—

Item	1948-49 to 1958-59	1959-60	Total
	£ s. d.	£ s. d.	£ s. d.
Organising Officers	121,618 2 9	12,409 11 5	134,027 14 2
General Publicity	64,474 14 9	6,447 9 8	70,922 4 5
Demonstrations	151,992 0 5	8,120 17 5	160,112 17 10
Competitions	7,437 7 4	..	7,437 7 4
Field Days	88 15 7	..	88 15 7
Herd Recording	187,523 10 11	29,308 6 11	216,831 17 10
Artificial Insemination	60,075 15 3	..	60,075 15 3
Statistical Work	18,034 1 9	..	18,034 1 9
Herd Surveys	26,165 6 8	..	26,165 6 8
Punch Card Equipment	17,316 0 1	6,924 18 4	24,240 18 5
Milking Machine Survey	7,475 8 7	6,008 1 0	13,483 9 7
Contribution towards attendance of representative at International Study Centre	400 0 0	..	400 0 0
Contribution towards attendance of representative at Maryland University	806 16 3	..	806 16 3
Milking Machine Testing Station	4,882 14 5	..	4,882 14 5
Survey—Infertility in Herds	1,889 12 5	2,394 9 5	4,284 1 10
Agricultural Trainees	8,000 0 0	4,000 0 0	12,000 0 0
Sire Survey	351 19 11	628 13 3	980 13 2
Overseas Visit of Senior Women's Extension Service Officer	1,127 13 11	..	1,127 13 11
Testing Stations—Air-flow Meters	..	2 10 0	2 10 0
Publication of Book "Weeds"	..	3,000 0 0	3,000 0 0
	£ 679,660 1 0	79,244 17 5	758,904 18 5

Commonwealth Grant—Expansion of Agricultural Advisory Services—N.S.W.

The Commonwealth Government agreed to make grants to the States to permit of the expansion of the Agricultural Advisory Services. Initially the grants were for a five year period ended 30th June, 1957. They were continued, however, for a further period of three years, which expired on 30th June, 1960. The Commonwealth Government has now agreed that further grants will be made for the period terminating 30th June, 1965.

Expenditure to 30th June, 1960, amounted to £442,170 6s. 1d. under the following headings:—

Item	1952-53 to 1958-59	1959-60	Total
	£ s. d.	£ s. d.	£ s. d.
Crop and Pasture Demonstration	85,414 2 5	2,131 13 6	87,545 15 11
Livestock Demonstrations	21,787 8 1	1,721 16 11	23,509 5 0
Horticultural Demonstrations	10,871 1 0	716 8 7	11,587 9 7
Agricultural Machinery Demonstrations	15,410 7 10	1,773 6 8	17,183 14 6
Irrigation Equipment and Demonstrations	1,072 4 11	2 8 9	1,074 13 8
Field Assistants and Motor Vehicles	100,919 5 4	26,918 19 11	127,838 5 3
Extension Aid Equipment	32,056 15 6	1,335 0 0	33,391 15 6
Publicity Officers	37,796 2 8	13,765 16 5	51,561 19 1
Production of Agricultural Publications	17,697 17 4	5,257 16 6	22,955 13 10
Production of Agricultural Films	2,109 8 6	761 8 7	2,870 17 1
Purchase of Books	5,147 11 3	1,138 18 7	6,286 9 10
Overseas Visits of Agricultural Officers	6,265 14 11	791 3 7	7,056 18 6
Agricultural Trainees and Cadets	35,080 13 1	8,376 15 10	43,457 8 11
Administration	4,747 9 3	1,102 10 2	5,849 19 5
Totals	£ 376,376 2 1	65,794 4 0	442,170 6 1

Noxious Insects Destruction Account

The Noxious Insects Act of 1934 provides for the striking of a levy under specified conditions, as a contribution towards the cost of suppression and destruction of noxious insects. The revenue is paid into Special Deposits Account and moneys at the credit of this Account are applied by the Minister for the purposes prescribed in the Act.

Expenditure from this Account has been heavy during the year and in order to meet commitments, pending receipt of revenue from levies struck, an amount of £50,000 was advanced by the Treasury as a "recoverable advance". This advance is to be repaid from revenue received from the levies which have been struck.

The need to prepare for an expected grasshopper plague during the year involved the purchase of poison and materials at a cost of £78,917 15s. 3d., an increase of £73,425 5s. 3d. over the cost in the previous year. The outbreak occurred and was dealt with by landholders and Pastures Protection Boards, by ground and aerial spraying under the Department's direction. This activity is dealt with elsewhere in this Report.

Following is a Statement of Receipts and Payments for the year 1959-60:—

RECEIPTS				PAYMENTS							
	£	s.	d.		£	s.	d.		£	s.	d.
Balance at 1st July, 1959	45,865	16	4	Poison and Materials	79,423	7	11				
Advance by State Treasury to be recovered ..	50,000	0	0	Less Refund on Drums, &c... ..	505	12	8				
Levies	19,658	2	4					78,917	15	3	
Sale of Equipment, etc.	667	17	0	Aeroplane Hire				2,519	18	4	
				Share of cost of Patrol Officer				848	0	0	
				Purchase of Motor Vehicle ..	1,201	10	0				
				Less Insurance adjustment on							
				utility damaged beyond							
				repair.....	400	0	0				
								801	10	0	
				Maintenance of Motor Vehicles	118	0	4	....			
				Less refund Insurance Premium	3	15	0				
								114	5	4	
				Advertising				25	4	7	
				Equipment purchases and repairs.....				66	19	0	
				Travelling Expenses				420	8	8	
				Freight and Cartage				801	5	2	
				Payroll Tax 1958-59				8	8	3	
				Telephone Services				29	11	9	
				Compensation to household for damage to							
				residence				27	0	0	
				Casual labour				38	1	6	
				Balance at 30th June, 1960				31,573	7	10	

Argentine Ant Eradication Campaign

The experimental campaign for eradication of Argentine Ants was successfully concluded on 1st December, 1959. The matter of re-organising the campaign on a different basis is now under consideration.

A total of 202 areas, covering 4,300 acres, which were subject to infestation have been sprayed since December, 1952. A further 20 areas, comprising some 600 acres, which are known to be infested, have not been treated.

The following is a statement of receipts and payments covering the activities for 1959-60:—

RECEIPTS			PAYMENTS		
	£	s. d.		£	s. d.
Balance at 1st July, 1959	149	13 5	Wages	3,361	12 2
Transfer from Consolidated Revenue Fund..	3,745	0 0	Payroll Tax 1958-59	241	13 9
Council Contributions—			Workers' Compensation Premium	145	13 0
Auburn	168	4 6	Travelling Expenses	65	19 5
Bankstown	142	12 0	Motor Vehicle Maintenance and Running Costs	334	2 2
Botany	1,058	10 1	Spray Materials	4,864	12 5
Canterbury	947	16 0	Spray Plant Maintenance and Running Costs..	119	4 9
Holroyd	1,856	1 8	General Stores and Expenses	90	9 3
Hornsby	112	19 11	New Plant	12	12 6
Kogarah	298	18 7	Rewards	105	0 0
Marrickville	606	18 3	Balance at 30th June, 1960	1,664	17 6
Parramatta	224	3 5			
Randwick	88	7 4			
Rockdale	215	6 0			
Sydney City	674	13 11			
Wollongong	144	9 11			
	6,539	1 7			
Contributions by other participating bodies—					
Maritime Services Board ..	221	13 9			
Department of Railways ..	350	8 2			
	572	1 11			
	£ 11,005	16 11		£ 11,005	16 11

Pastures Protection Boards of New South Wales—Subsidy to Glenfield Veterinary Research Station

Receipts and payments for the year ended 30th June, 1960, were:—

RECEIPTS			PAYMENTS		
	£	s. d.		£	s. d.
Balance as at 1st July, 1959	700	0 0	Salaries	2,289	5 0
Contribution (a)	2,400	0 0	Workers' Compensation Insurance Premium..	75	19 8
			Advertising	42	1 6
			Travelling Expenses	20	6 3
			Payroll Tax, 1958-59	71	14 6
			Balance as at 30th June, 1960	600	13 1
	£3,100	0 0		£3,100	0 0

Note.—(a) Includes £650 received June, 1960, but not credited until July, 1960.

Potato Growers' Licensing Act, 1940 (as amended)

Transactions on this Account for the year 1959-60 were:—

RECEIPTS			PAYMENTS		
	£	s. d.		£	s. d.
Balance as at 1st July, 1959	790	14 9	Grants to Potato Growers' Association	1,500	0 0
Licence Fees	1,863	16 6	Administrative Costs, 1958-59	87	0 0
			Postages	61	11 10
			Printing and Stationery	37	6 11
			Balance at 30th June, 1960	968	12 6
	£2,654	11 3		£2,654	11 3

Shannon Vale Nutrition Station—Working Account

Statement of Receipts and Payments for the year ended 30th June, 1960:—

RECEIPTS				PAYMENTS						
	£	s.	d.	£	s.	d.		£	s.	d.
Balance at 1st July, 1959				2,030	4	5	Wages	1,515	7	0
Sale of Wool	5,072	5	8				Payroll Tax, 1958-59	28	13	10
Sale of Livestock	306	18	0				Workers' Compensation Insurance Premiums—			
Sale of Skins	19	10	0				1958-59 and 1959-60	46	13	1
Sale of Seed	540	17	1				Freight and Cartage	680	8	10
Sale of Shearing Plant	80	0	0				Fertilizers	478	0	0
Agistment	100	16	8				General Supplies	411	5	0
Rent of Cottage	34	16	7				Fencing	18	9	8
				6,155	4	0	Plant Purchases and Repairs	179	11	4
							Motor Spirit and Oil	97	2	4
							Tractor—Third Party and Comprehensive Insurance	11	1	5
							Part Cost of Sheep Dip and Yards	135	8	0
							Part Repayment of Advance by State Treasury for Provision of Water Supply	900	0	0
							Balance at 30th June, 1960	3,683	7	11
				£8,185	8	5		£8,185	8	5

OTHER ACCOUNTS

Contribution by Milk Board to meet cost of Herd Testing for Tuberculosis

Although these operations are within the framework of the Consolidated Revenue Fund, separate accounts are kept within the Department to show the annual financial result. Following is a Statement of Receipts and Payments for the year ended 30th June, 1960, in respect of this service:—

RECEIPTS				PAYMENTS			
	£	s.	d.		£	s.	d.
Contributions from Milk Board (a).....	4,500	0	0	Salaries	2,948	4	10
				Employer's Superannuation Contribution ..	202	0	7
				Travelling Expenses	491	7	5
				Postage and Telephones	7	18	4
				Printing	4	19	1
				Workers' Compensation Insurance Premiums	75	9	9
				Payroll Tax	84	4	6
				Balance—Overpayment by Milk Board	685	15	6
	<u>£4,500</u>	<u>0</u>	<u>0</u>		<u>£4,500</u>	<u>0</u>	<u>0</u>

Note.—(a) £172 18s. 7d. was also received in 1959-60 in respect of 1958-59.

Veterinary Surgeons' Act, No. 25 of 1923

The Act provides for the establishment of a Board to be called "Board of Veterinary Surgeons of New South Wales." Fees and penalties collected under the Act are paid to the credit of Consolidated Revenue Fund, from which administrative expenses are met. There were 417 registered Veterinary Surgeons at 30th June, 1960.

Receipts and Payments for the financial year 1959-60 were:—

RECEIPTS			PAYMENTS		
	£	s. d.		£	s. d.
Registration Fees	18	18 0	Salaries	505	17 4
Restoration Fees	12	12 0	Members' Fees	93	9 0
Roll Fees	882	0 0	Travelling Expenses	6	14 8
Examination Fees	42	0 0	Postage	21	3 2
			Printing	46	17 4
			Examination of Foreign Graduates—		
			Examination Fees	63	0 0
			Travelling Expenses	24	6 3
				87	6 3
			Excess Receipts over payments	194	2 3
	£955	10 0		£955	10 0

Meat Inspection Service

This service is administered under the Meat Industry Act, 1915 (as amended) which makes provision for inspection fees.

The Act was amended during the year by Act No. 5 of 1960 to provide for inspection fees to be paid on all carcasses which are stamped with the State Meat Inspection stamp, irrespective of the purpose for which the carcasses are intended. The amendment was operative from 4th April, 1960.

Prior to this amendment carcasses for export which bore both the State and Commonwealth Meat Inspection stamps were exempt from payment of fees under the Meat Industry Act, 1915 (as amended).

The Metropolitan Meat Industry Board and the Department of Health bear the full cost of meat inspections at the State Abattoir, Homebush Bay, and Knackeries, respectively. The cost of the service at other Slaughterhouses is covered by fees collected.

The following statements show the cost of the service, the payments made by the Metropolitan Meat Industry Board and the Department of Health and the revenue received for 1959-60:—

EXPENDITURE			INCOME		
	£	s. d.		£	s. d.
Homebush Abattoir—			Receipts from Metropolitan Meat Industry Board	59,441	8 10
Salaries and Wages	79,133	6 0	Deduct amount recouped by Metropolitan Meat Industry Board in respect of 1958-59 and received in 1959-60	2,921	10 7
Retirement Leave Payments	1,431	6 8		56,519	18 3
Endowment Fund Subsidy	1,050	4 0	Balance—being amount to be recouped by Metropolitan Meat Industry Board in respect of the quarter ended 30th June, 1960	33,083	3 0
*Travelling Expenses	219	4 10		£89,603	1 3
*Freight and Cartage	0	6 3			
*Postal and Telephone	143	6 3	Inspection Fees—		
*General Stores	674	9 0	Regulation 7 (Country Abattoirs)	97,184	19 8
Employer's Superannuation Contributions	3,333	12 0	Regulation 8 (Interstate)	18,916	8 6
Workers' Compensation Insurance	1,636	16 7	Regulation 9 (Other Abattoirs in County of Cumberland)	23,094	9 9
Payroll Tax	1,980	9 8	Regulation 10 (Private Saleyards)	104	1 10
	£89,603	1 3	Government Institutions	400	0 0
				139,699	19 9
Other Slaughterhouses—			Less Inspection Fees—Owing at 30th June, 1959	6,751	17 5
Salaries and Wages	121,545	11 11		132,948	2 4
Retirement Leave Payments	1,336	16 11	Plus Inspection Fees—Owing at 30th June, 1960	38,273	6 7
Endowment Fund Subsidy	2,039	9 5		£171,221	8 11
*Travelling Expenses	9,767	14 9			
*Freight and Cartage	23	19 0	Recoup of Expenditure from Department of Health	3,051	1 10
*Postal and Telephone Expenses	180	19 3	Less Amounts Owing during 1958-59	564	7 5
*General Stores	826	19 7		2,486	14 5
*Gas and Electricity	6	8 7	Plus Amounts Accrued and Unpaid during 1959-60	1,309	12 2
*Rent	133	3 4		£3,796	6 7
Employer's Superannuation Contributions	7,148	13 7			
Workers' Compensation Insurance	2,495	6 2			
Payroll Tax	3,243	18 3			
Excess of Income over Expenditure	22,472	8 2			
	£171,221	8 11			
Knackeries—					
Salaries and Wages	2,420	7 0			
Endowment Fund Subsidy	125	7 3			
*Travelling Expenses	592	18 6			
Workers' Compensation Insurance	50	5 4			
Surcharge on Salaries to provide for leave, etc.	607	8 6			
	£3,796	6 7			

* These represent actual payments; accruals have not been taken into consideration.

Fund Created by Wheat Marketing (Barring of Claims) Act No. 22 of (as amended by Act No. 38 of 1930)—

REVENUE ACCOUNT FOR THE YEAR ENDED 30TH JUNE, 1960

	£	s. d.		£	s. d.
To Balance—Net surplus transferred to Accumulated Funds Account	1,652	11 6	By Interest on Investments (Government Securities)	1,602	2 1
	£1,652	11 6	„ Bank Interest	50	9 5
				£1,652	11 6

BALANCE SHEET AS AT 30TH JUNE, 1960

LIABILITIES			ASSETS		
	£	s. d.		£	s. d.
Accumulated Funds as at 1st July, 1959	42,101	1 8	Investments in Government Securities (face value)	40,520	0 0
Net Surplus for the year ended 30th June, 1960	1,652	11 6	Balance at Commonwealth Savings Bank	2,829	7 10
	£43,753	13 2	Interest accrued to 30th June, 1960	404	5 4
				£43,753	13 2

STATEMENT OF RECEIPTS—CONSOLIDATED REVENUE FUND—FINANCIAL YEAR, 1959-60

Institution	Sale of Farm Produce and Livestock, etc.	Students' Fees	Rents, etc.	Other Receipts	Net Receipts
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Hawkesbury Agricultural College	17,974 19 1	35,675 17 4	5,551 5 9	4,434 19 11	63,637 2 1
Wagga Agricultural College and Experiment Station	14,128 7 5	13,002 1 4	7,650 11 10	731 3 0	35,512 3 7
Alstonville Tropical Fruit Research Station ..	.....	.....	187 4 5	.....	187 4 5
Bathurst Experiment Farm	10,890 11 6	.....	227 9 7	12 11 0	11,130 12 1
Condobolin Experiment Farm	5,366 2 6	.....	187 19 4	9 14 6	5,563 16 4
Cowra Experiment Farm	2,514 10 6	.....	211 8 3	22 5 7	2,748 4 4
Gosford Citrus Experiment Station	1,819 12 10	.....	180 3 7	19 14 10	2,019 11 3
Grafton Experiment Farm	9,651 19 2	.....	344 3 7	124 18 9	10,121 1 6
Griffith Viticultural Nursery	1,052 2 11	.....	47 0 1	17 16 1	1,116 19 1
Leeton Experiment Farm	11,383 8 10	.....	169 2 4	3 11 9	11,556 2 11
Lower Murray Research Station	175 1 11	.....	106 17 6	.....	281 19 5
Narrabri Experiment Farm .....	.....	.....	289 9 7	.....	289 9 7
New England Experiment Farm	4,390 3 6	.....	621 5 7	152 1 4	5,163 10 5
Seven Hills Poultry Experiment Station	6,522 5 7	.....	213 0 8	3 2 11	6,738 9 2
Tamworth Agricultural Experiment Station ..	60 13 10	.....	74 7 3	.....	135 1 1
Temora Experiment Farm	5,657 0 2	.....	539 9 4	97 1 3	6,293 10 9
Trangie Agricultural Experiment Station	21,610 0 6	.....	2,291 4 6	219 16 3	24,121 1 3
Wollongbar Experiment Farm	7,291 7 3	.....	520 11 10	164 13 6	7,976 12 7
Yanco Experiment Farm	12,057 4 9	160 10 0	2,533 3 1	8 13 1	14,759 10 11
Total	£ 132,545 12 3	48,838 8 8	21,945 18 1	6,022 3 9	209,352 2 9

Division	Particulars	Net Receipts
		£ s. d.
Central Administration	Fees—Farm Produce Agents' Act, 1926-1932	318 3 0
	Fees—Fertilisers Act, 1934	227 12 0
	Fees—Apiary Registrations	2,723 16 9
	Fees—Pest Destroyers Act, 1945	647 8 0
	Fees—Registration of Stock Brands	1,404 8 9
	Fees—Registration of Swine Brands	110 8 10
	Fees—Stock Foods and Medicines Act, 1940	1,344 15 0
	Fees—Veterinary Surgeons' Act, 1923	955 10 0
	Fees—Public Officers'—Witness Expenses	22 17 0
	Fees—Analyses	74 15 6
	Fees—Flour Certificates	358 1 0
	Fines and Forfeitures	24 0 0
	Forfeitures of Bonds	3,992 8 3
	Commission for collection of Premiums—Group Assurance Scheme	879 17 10
	Commission for collection of Premiums—Hospital Contribution and Medical Benefits Funds	214 11 0
	Commission for collection of subscriptions—Public Service and Professional Officers' Associations	156 3 1
	Commission for collection of Judgment Debts	23 18 7
	Interest on Advances from A.D.W.A. ....	.....
	Sundry Sales .....	.....
	Sale of Government Property	759 10 0
	Transfer of Part Balances not required	7 1 2
	Exchange on Cheques and Remittances	200 11 11
	Three per cent. Contribution by Pastures Protection Boards	21,273 9 8
	Broadcasting Fees	4 10 2
	License Fees—Pastures Protection Act	56 5 0
	Postages	36 19 10
	Employer's Liability to State Superannuation Fund	3,714 1 7
	Administration of Cattle Compensation Fund	17,184 18 8
	Fees—Public Officers'—Jurors	1 10 0
	Conscience Money	0 10 0
	Donation	5 0 0
	Total	£ 56,723 2 7
Division of Plant Industry	Fees—Certification of Seed	6,871 9 0
	Fees—Certification of Bean Seed	1,986 16 0
	Fees—Certification of Sweet Sorghum Seed	424 11 6
	Fees—Certification of Sorghum Alnum Seed	138 7 6
	Fees—Registration of Hybrid Seed Maize	2,563 15 6
	Fees—Seed Testing	517 2 6
	Commonwealth Contribution towards Administration of Plant Quarantine	1,536 15 9
	Total	£ 14,038 17 9
Division of Horticulture	Fees—Inspection—Plant Diseases Act	2,304 18 8
	Fees—Fumigation—Plant Diseases Act	12 3 9
	Fees—Certification of Seed Potatoes	1,058 15 4
	Contribution by Commonwealth Government—Administration of Commerce Act	8,402 8 9
	Administration of Plant Quarantine	29,117 4 11
	Total	£ 40,895 11 5

Statement of Receipts—Consolidated Revenue Fund—Financial Year 1959-60—continued

Division	Particulars	Net Receipts		
		£	s.	d.
Division of Dairying	Fees—Grading—Dairy Industry Act	4	8	4
	Fees—Licence—Dairy Industry Act	11	0	0
	Fees—Registration—Dairy Industry Act	23	0	0
	Fees—Dairy Science Schools	183	14	6
	Fees—Herd Recording	43,171	16	2
	Commonwealth Grant towards cost of Herd Recording	29,308	6	11
	Total	£	72,702	5 11
Division of Animal Industry— Head and District Offices	Fees—Cattle Export	97	17	0
	Fees—Chicken Sexing Examinations	13	2	0
	Fees—Honey Certificates	30	10	6
	Fees—T.B. Testing of Cattle	169	18	0
	Fees—Vaccination of Calves	15	15	6
	Fees—Inspection of Pigs			
	Fees—Meat Inspection	202,192	10	5
	Contribution by Commonwealth Government—Administration of Animal Quarantine	16,486	5	1
	Contribution by Milk Board—T.B. Testing of Herds	4,672	18	7
	Rent—Pymont Depot	1,300	0	0
	Glenfield Veterinary Research Station— Sale of Farm Produce, etc.	5,536	17	3
	Telephone Calls (Private)	27	12	7
	Electricity supplied to Officers	155	4	9
	Exchange on Cheques and Remittances	1	17	6
	Rents	321	19	2
	Total	£	231,022	8 4
Division of Animal Industry— Queensland Border	Fees—Dipping Stock	5,182	4	6
	Rents	896	4	2
	Exchange on Cheques and Remittances	5	2	8
	Total	£	6,083	11 4
Division of Animal Industry— Tick Quarantine Areas	Fees—Fumigation	14	12	4
	Rents	87	19	6
	Exchange on Cheques and Remittances	0	1	0
	Contribution by Commonwealth Government in respect of Cattle Tick Eradication	477,058	10	1
	Sale of Government Property	40	0	0
	Total	£	477,201	2 11
Royal Botanic Gardens and Allied Activities	Rents—Exclusive of Land (Ground Fees, Kiosk Rents, etc.)	3,060	5	4
	Lavatory Takings	106	7	9
	Sale of Government Property			
	Rents	570	2	11
	Contribution by Commonwealth Government—Maintenance of Gardens at Admiralty House	5,637	4	10
	Total	£	9,374	0 10
Department of Agriculture	Repayments to Credit of Vote—Previous Years—Hawkesbury and Wagga Agricultural Colleges and Experiment Farms	4,167	13	1
	Other	10,956	11	2
	Total	£	15,124	4 3

SUMMARY OF RECEIPTS

Particulars	Net Receipts		
	£	s.	d.
Agricultural Colleges, Farms, Stations and Nurseries	209,352	2	9
Central Administration, Divisions, etc.	908,041	1	1
Department of Agriculture—Repayments to Credit of Votes—Previous Years	15,124	4	3
Total	£	1,132,517	8 1

EXPENDITURE FROM CONSOLIDATED REVENUE FUND AND GENERAL LOAN ACCOUNT, 1959-60
(See Separate Statement for Expenditure from Special Deposits Account)

Section	Consolidated Revenue Fund				General Loan Account	Total Expenditure by Department of Agriculture	Expenditure by Other Departments				Grand Total Expenditure																			
	Salaries and Payments in the nature of Salary	Maintenance and Working Expenses other than Salaries	Other Services	Total			Consolidated Revenue Fund			General Loan																				
					£	s.	d.	£	s.		d.	£	s.	d.	£	s.	d.													
Central Administration	596,348	18	10	90,400	7	11	70,983	15	10	757,732	6	3	59,199	10	11	36,825	2	6	229,241	15	7	351,365	14	10	1,109,098	1	1			
Division of Plant Industry	188,115	14	2	33,293	14	1	6,815	3	9	228,224	12	8	.....	.....	.....	1,079	2	2	.....	.....	.....	2,023	10	6	230,248	3	2			
Division of Horticulture—																														
Fruit	121,990	18	10	21,318	7	1	6,032	16	7	149,342	10	6	.....	.....	.....	283	8	6	3 19	6	1,303	19	7	1,591	7	7	150,933	18	1	
Export and Import Branch	15,562	2	11	803	7	7	1,950	0	7	18,315	10	6	.....	.....	.....	.....	.....	.....	40 11	6	184	12	6	225	4	0	18,540	14	6	
Plant Quarantine Service	28,485	0	5	1,968	5	9	.....	.....	.....	30,453	6	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	30,453	6	2		
Division of Dairying—																														
General	79,432	13	8	14,754	15	3	276	10	0	94,463	18	11	.....	.....	.....	191	5	4	.....	.....	830	18	5	1,022	3	9	95,486	2	8	
Head Recording	77,059	13	0	23,538	10	6	436	17	3	101,035	0	9	.....	.....	.....	1,356	7	10	3,337	9	6,670	9	1	11,364	6	7	101,035	0	9	
Hawkesbury Agricultural College	136,141	14	2	67,383	13	9	17,807	10	8	221,352	18	7	36,027	19	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2,687	25	4		
Wagga Agricultural College and Experiment Station	63,823	17	4	36,152	9	3	7,866	3	0	107,842	9	7	5,921	16	5	569	14	1	1,346	8	3,053	6	11	4,969	9	0	118,733	15	0	
Alstonville Tropical Fruit Research Station	3,461	0	0	1,490	1	1	339	16	0	5,280	17	1	16,735	3	5	21	2	3	19 9	3	223	2	11	26	14	3	22,039	14	9	
Bathurst Experiment Farm	15,977	7	8	6,654	14	10	157	3	11	22,889	0	9	817	5	3	10	13	6	338	9	92	2	5	103	15	11	23,471	15	3	
Condonbolin Experiment Farm	13,345	19	8	3,380	18	3	1,710	14	0	21,618	2	6	696	16	0	15	2	11	44 19	0	160	3	0	156	5	0	14,371	18	6	
Cowra Experiment Farm	15,827	16	2	4,037	11	9	55	0	8	13,518	17	6	2,978	13	3	12	3	11	6 0	0	106	10	7	174	13	6	23,080	15	1	
Gosford Citrus Research Station	25,601	17	7	8,977	2	3	1,300	10	8	39,879	10	6	.....	.....	.....	17	5	4	9 9	0	204	2	11	230	17	3	40,110	7	9	
Grafton Experiment Farm	19,167	7	9	457	4	5	72	7	0	41,609	19	2	.....	.....	.....	1	1	0	13 5	0	45	15	2	60	1	2	40,110	7	9	
Griffith Viticultural Nursery	19,631	7	9	10,045	17	1	4,065	5	0	33,279	1	9	3,532	6	9	21	0	3	362	19	520	2	9	904	2	6	37,715	11	0	
Leeton Experiment Farm	2,654	0	11	609	4	3	113	13	10	3,938	2	7	2,141	15	6	.....	.....	.....	.....	.....	.....	.....	.....	474	10	0	4,447	4	0	
Lower Murray Research Station	6,054	10	10	2,290	19	8	702	12	1	9,038	2	6	1,000	3	0	25	9	11	.....	.....	.....	.....	.....	689	8	7	11,205	8	0	
New England Experiment Farm	19,186	8	4	7,749	17	3	317	18	11	27,454	5	6	10,865	3	0	174	15	6	96	6	0	531	13	1	34,085	14	4			
Seven Hills Pottery Experiment Station	15,371	18	5	6,334	15	5	3,589	0	10	22,550	11	10	23,861	18	11	174	15	6	.....	.....	.....	.....	.....	699	8	7	29,142	14	1	
Tamworth Agricultural Experiment Station	5,193	14	11	3,425	9	7	2,988	19	4	12,208	5	4	.....	.....	.....	175	16	10	118	5	0	531	13	1	36,228	5	6			
Traralgon Experiment Farm	12,726	4	11	4,516	16	10	3,403	1	5	20,232	1	1	.....	.....	.....	76	14	7	17 10	2	44	6	8	138	1	3	20,710	14	6	
Tenmore Agricultural Experiment Station	21,757	15	2	9,118	15	11	5,784	1	2	36,422	11	5	.....	.....	.....	88	4	10	.....	.....	.....	.....	.....	1,246	2	7	37,668	14	0	
Wollongbar Experiment Farm	37,660	5	8	17,936	15	2	7,738	13	0	64,344	16	10	2,529	17	6	44	6	1	44	0	.....	.....	.....	317	0	1	30,409	19	10	
Yanco Experiment Farm	36,669	8	8	17,936	15	2	2,250	0	0	2,250	0	0	3,157	2	2	192	4	6	570	4	5	2,882	4	4	3,644	13	3	71,146	12	3
Tobacco Research	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2,250	0	0		
Division of Animal Industry—	158,149	14	3	28,398	15	4	4,371	16	2	190,920	5	9				940	7	9							2,051	9	9	192,971	15	6
Head and District Offices	48,421	16	4	9,680	2	11	737	10	8	58,839	9	11				16	0	10	279	13	6	1,146	11	9	1,442	6	1	60,281	16	0
Glentworth Veterinary Research Station	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Berry	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Meat Inspection Service—	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Honebush	80,564	12	8	2,087	10	4	.....	.....	.....	82,652	3	0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	82,652	3	0	
Other Abattoirs	122,882	8	10	12,845	10	7	.....	.....	.....	135,727	19	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	135,727	19	5	
Knackeries	2,420	7	0	718	5	9	.....	.....	.....	3,138	12	9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3,138	12	9	
Animal Quarantine Service	13,507	15	8	901	4	5	.....	.....	.....	14,409	0	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	14,409	0	1	
Queensland Border Control	44,765	16	0	16,857	5	6	1,035	0	0	62,688	1	6	3,491	12	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	66,149	13	10	
Tick Quarantine Areas	624,356	14	10	263,781	19	9	20,681	4	2	908,819	19	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	908,819	19	4	
Royal Botanic Gardens and Allied Activities	114,389	0	8	7,176	2	6	19,824	17	10	141,420	2	6				963	6	9	459	8	7	12,279	0	9	6,750	0	0	161,871	18	7
Totals	£ 2,765,131	3	1	738,567	0	7	189,624	17	10	3,693,323	1	6	114,353	5	5	42,981	0	11	7,567	3	0	60,744	5	5	235,991	15	7	406,483	15	10

(2) Being Expenditure on—
Gas and Electricity

(1) Being Expenditure on—
Stores, Stationery, Furniture, etc.
Cleaning Services

Totals

APPENDIX II

Published Matter*, 1959-60

*Viz.:—Matter printed as Department of Agriculture (D. of A.) booklets, or contributed to and printed as articles in Department of Agriculture journals (the monthly *Agricultural Gazette of N.S.W.*, the quarterly *Review of Marketing and Agricultural Economics*, the bi-monthly *Dairy Topics*) or the journals of other institutions/organisations.

The Appendix does not list the many times greater volume of items contributed, in the course of extension service, to such media as the Department's weekly printed broadsheet, *Press Copy*, and regional publicity releases, for newspapers and radio stations. A statistical account of that published matter is included in this report under "Division of Information Services—Editorial Section" and "Regional Extension Services—Regional Publicity".

A. DIVISION OF PLANT INDUSTRY

D. of A. Booklets

- Anon.—Broad Beans. 3 pp.
 Anon.—Cucumber Growing. 5 pp., ill.
 Anon.—Lettuce Growing. 9 pp., ill.
 Anon.—Tomato Culture Under Glass. (2nd ed.) 29 pp., ill.
 Cutting, F. W.—Fodder Crops for the Cootamundra District. 20 pp., ill.
 Cutting, F. W.—Pastures for the Cootamundra District. 95 pp., ill.
 Douglas, N. J.—Pastures for Cooma District. 67 pp., ill.
 Noonan, J. B.—Pastures for Taree District. 65 pp., ill.
 Squire, M. J. E.—Making Good Silage. 43 pp., ill.
 Walkden Brown, C.—An Outline of the Wheat Growing Industry in N.S.W. 42 pp., ill.
 Walkden Brown, C. and Macindoe, S. L.—Wheat Breeding and Varieties in Australia. 223 pp., ill.
 Whittet, J. N.—Weeds. (Farmers' Handbook.) 404 pp., ill.

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- Anon.—Grading Potatoes for Better Prices. *Agric. Gaz. N.S.W.*, 71: 6, 281-286, 295. Ill.
 Campbell, M. B.—Only Well-Managed Sown Pastures Provide Permanent Tussock Control. *Agric. Gaz. N.S.W.*, 71: 1, 9-19.
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 Jessup, R. J.—Breeding Potatoes for Resistance to Common Scab. Vegetable Research Conference Report (C.S.I.R.O.) 1959. 1: 20, 2 pp.
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 Nicholson, G.—Storage of Grain on Farms. *Agric. Gaz. N.S.W.*, 70: 11, 561-573. Ill.
 Shirlow, N. S.—Tomatoes—a Crop Review. Vegetable Research Conference Report (C.S.I.R.O.) 1959. 1: 1, 10 pp.
 Spencer, R. T.—Asparagus—a Crop Review. Vegetable Research Conference Report (C.S.I.R.O.) 1959. 1: 2. 18 pp.
 Spencer, R. T. and Tindale, E.—Production of Field Beans. *Agric. Gaz. N.S.W.*, 71: 6, 287-295. Ill.

Strang, J.—Production of Perennial Ryegrass Seed in Kangaroo Valley. *Agric. Gaz. N.S.W.*, 70: 9, 486.

Strang, J. and Broue, P.—Pasture Establishment—Drill vs. Broadcast. *Agric. Gaz. N.S.W.*, 70: 12, 617-621. Ill.

Strang, J.—Pasture Management for the South Coast, *Agric. Gaz. N.S.W.*, 71: 3, 113-116, 162. Ill.

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B. DIVISION OF HORTICULTURE

D. of A. Booklets

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 Anon.—Preserving Fruit and Vegetables in the Home. (Revised.) 67 pp., ill.
 Anon.—Jam Making. (Revised.) 16 pp., ill.
 Bryden, J. D. and Mort, C. H.—Almond Culture. (Revised.) 19 pp., ill.
 Whittaker, E. C., Levitt, E. C. and Holbeche, J. A.—Propagation of Fruit Trees. (Revised.) 16 pp., ill.

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 Anon.—Walnut Growing, *Agric. Gaz. N.S.W.*, 70: 9, 481-483.
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Whittaker, E. C. and Henry, P.—Concentrate Spraying in New South Wales. *Agric. Gaz. N.S.W.* 70: 12, 631-637.

C. DIVISION OF ANIMAL INDUSTRY

(i) GLENFIELD VETERINARY RESEARCH STATION

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Cotsell, J. C., and Edgar, G.—The Utilization of Sown Pastures in Merino Breeding on the Granite Soils of Eastern New England. *Aust. Vet. J.*, 35: 515-526.

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Sinkovic, B.—Haemorrhagic Disease in Chickens. *Veterinary Inspector*, 1959, p. 43.

(ii) BEEF CATTLE, HORSES AND GOATS SECTION

Contributions to Journals

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(iii) PIGGERY SECTION

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Simpson, G. H.—Improved Pig Sheds. *Agric. Gaz.*, 70: 9, 500-506.

(iv) POULTRY SECTION

D. of A. Booklets

Brann, V. H.—Getting Started in Poultry Farming. (Revised.) 18 pp., ill.

Anon.—Worms in Pigs. (Revised.) 30 pp., ill.

Anon.—Worm Infestation in Fowls. (Revised.) 8 pp., ill.

Wilkins, S. J. Culling Poultry. (Revised.) 16 pp., ill.

McClymont, G. L., and McDonald, M. W.—Scientific Poultry Feeding. (Revised.) 52 pp., ill.

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Brann, V. H.—Breeding with a New Look. *Poultry Farmer*, April, 1960.

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(v) APICULTURE SECTION

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D. DIVISION OF DAIRYING

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- Harrison, H.—Fodder Crop Rotations Succeed on North coast. *Dairy Topics*, 5: 2, 14-15.
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E. DIVISION OF SCIENCE SERVICES

(i) BIOLOGICAL BRANCH

D. of A. Booklets

- Anon.—Diseases of Barley. (Revised.) 12 pp., ill.
- Anon.—Mushroom Culture. (Revised.) 50 pp., ill.

Contributions to Journals

- Anon.—Abnormalities in Fruit Setting. *Agric. Gaz. N.S.W.*, 70: 9, 475-476.
- Anon.—Anthracnose of Berry Fruits. *Agric. Gaz. N.S.W.*, 71: 3, 143.
- Anon.—Bacterial Canker of Stone Fruit. *Agric. Gaz. N.S.W.*, 70: 12, 652-654.
- Anon.—Bacterial Canker of Tomatoes. *Agric. Gaz. N.S.W.*, 70: 9, 477-479.
- Anon.—Brown Fleck or Internal Brown Spot of Potatoes. *Agric. Gaz. N.S.W.*, 71: 4, 242.
- Anon.—Blossom-end Rot of Tomato. *Agric. Gaz. N.S.W.*, 70: 9, 479-480.
- Anon.—Bordeaux Mixture. *Agric. Gaz. N.S.W.*, 71: 4, 238-239.
- Anon.—Disease Control in Vegetable Growing. *Agric. Gaz. N.S.W.*, 71: 1, 26-31.
- Anon.—Disease in the Flower Garden. *Agric. Gaz. N.S.W.*, 70: 7, 343-345.
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- Anon.—Flag Smut of Wheat. *Agric. Gaz. N.S.W.*, 71: 3, 140-142.
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- Anon.—Septoria Spot of Tomatoes. *Agric. Gaz. N.S.W.*, 70: 1, 41.
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- Anon.—Transport and Market Diseases of Vegetables. *Agric. Gaz. N.S.W.*, 70: 11, 607-612.
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- Conroy, R. J. and Blake, C. D.—Nematode Pests of Mushrooms. *Agric. Gaz. N.S.W.*, 70: 12, 644-648.
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(ii) ENTOMOLOGY BRANCH

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- Aphids or Plant Lice Insect Pest Leaflet No. 33. (Revised.)
- Argentine Ant, Insect Pest Leaflet No. 111. (Revised.) 8 pp.
- Citrus Scale Insects and Citrus Mites, Insect Pest Leaflet No. 63. (Revised.) 6 pp.
- Household Insect Pests, Insect Pest Leaflet No. 47. (Revised.) 31 pp.
- Red Spider, Insect Pest Leaflet No. 37. (Revised.) 6 pp.
- 6 Wax Scales, Insect Pest Leaflet No. 4. (Revised.) 5 pp., ill.
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